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Science

THE SCIENTISTS NEWSWEEKLY



Maurice Ewing, of the Geology Department, Columbia University, shown on the deck of the research ship *Atlantis* prior to its sailing on July 15. Prof. Ewing is directing the group of scientists who will survey part of the mid-Atlantic Ridge 1,200 miles east of Bermuda. The expedition is being sponsored by the National Geographic Society, Columbia University, and the Woods Hole Oceanographic Institution (see *News and Notes*).

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Scientific Publishing in Europe
James S. Thompson and Charles H. Brown

Includes Newly-Discovered Elements

NEW 1947 CHART OF THE ATOMS

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Technical Book Publishing in Europe, 1947:

Impressions From Visits to Eleven Countries

James S. Thompson, *Executive Chairman of the Board,*
McGraw-Hill Book Company, Inc., New York City

CAN THE SWISS PUBLISHERS SUCCEED the German and dominate Europe as they did during the Reformation and in the 18th Century?

Will German publishers in science and technology, encouraged by the help of the U. S. and British governments in stabilizing the national economy, revive in this generation to their pre-Nazi status?

Will expanding use of English in Europe provide permanent new audiences for U. S. and British technical publishers?

With Britain spending \$18,000,000 annually through its Council to influence world-wide circulation of British books, what should the U. S. Congress appropriate for State Department aid to our Information Library program, in which science and technology are the leading subjects in demand?

These are only a few of a host of questions that stir the imagination of an American technical book publisher returning to New York after 9 stimulating weeks in 11 European countries.

Contacts with publishers, educators, librarians, and book dealers were made on a plane of reciprocal interest, which was well expressed in part of the letter of introduction from the late editor of *Science*, Willard L. Valentine, written just before his death: "We are anxious to know the progress of research in the various scientific fields, the plans for reviving scientific publishing, both in the book fields and scientific journals, and the extent to which faculties and laboratory facilities are now operating in comparison with prewar standards. The American Association for the Advancement of Science and its editors are most anxious to be of service to scientists everywhere, and we shall feel honored if you will give us the opportunity to be of assistance to you, your staff, and your organizations."

In presenting this report, which is necessarily brief because of travel time and space limitations, this correspondent wishes to record his awareness of probable omission of important items. Special thanks are due the Publishing Association executives who supplied statistical data, and also U. S. Embassy staff members. It is hoped that the material may be helpful in accelerating reciprocal relations, including translations, especially for the aid of those who may not be bilingual, and that this modest effort may also be helpful in the larger movement for better international understanding.

As in the United States, World War II has released a vast flood of energy and funds for research in Europe. Just before leaving England I noted that the British government had announced the appropriation of £250,000 (to rise later to £350,000) annually for research in mechanical engineering. In Sweden new plans were announced for coordination of bibliographical material on research. In France new publications, including one on research in nutrition, were discovered, and, as implied above, Switzerland is newly acclaimed in technical publishing.

GREAT BRITAIN

In Great Britain an American feels thoroughly at home in attempting to appraise the technical publishing situation. The paper shortage, the lag in numbers of scientific personnel, the surge of new subject matter to be published, and the postwar revival of book output are, in varying degrees, similar to our own problems.

Typical of this is the spirit of the program of the British Association for the Advancement of Science meeting at Dundee, August 27-September 3, 1947. The Council decided that, in order to emphasize the positive contribution of science to human progress, the program should conform to the general theme, Swords to Ploughshares. In the corridors there undoubtedly will be much discussion, as there would be at home, of the Government bill for original scientific work, with its appropriation of £74,000,000. The proportion for research is said to be more than the government prewar expenditure for education. Men of science are increasingly concerned about an imbalance in the proportion of government- to nongovernment-sponsored work, and there is an active body of opinion which calls on scientists and universities to refuse to accept contracts which include a ban on the publication of results.

British research programs will go forward rapidly with respect to equipment availability, according to Secretary Lowe of the British Association, but during the next 10 years, great effort will be expended in meeting the requirements of the Barlow Report: to double the rate of output of scientists and also to comply with the standards of the Percy Report on Higher Technological Education. As in the United States, problems of housing, buildings, and teacher personnel are serious.

International collaboration among scientists and the potential results for publishers are emphasized in current

meetings. Just now available, for example, is the first volume of the new annual series of Symposia of the Society of Experimental Biology, *Nucleic acid*. This comprises 19 papers presented at Cambridge in 1946, the authors of which are residents of Belgium, Denmark, England, Scotland, Sweden, and the United States. The second volume, to contain the papers presented at the 1947 symposium, will be entitled *Growth in relation to differentiation and morphogenesis*. In the preface the Society expresses indebtedness to Imperial Chemical Industries, Ltd., the Rockefeller Foundation, and the British Council for Financial Aid.

TABLE 1
BRITISH TECHNICAL BOOK PRODUCTION: OUTPUT FIGURES*

Subject	1939	1940	1941	1942	1943	1944	1945	1946
Aeronautics.....	53	90	118	159	148	88	67	66
Archaeology.....	58	39	21	12	17	14	9	18
Astronomy.....	41	29	15	19	21	16	18	27
Botany, horticulture, & agriculture.....	200	95	92	76	58	56	73	102
Chemistry & physics.....	120	101	43	62	52	72	69	102
Engineering.....	168	139	91	158	101	132	112	198
Geology.....	48	32	12	19	18	11	20	17
Mathematics.....	54	32	35	28	46	18	37	64
Medicine & surgery.....	498	374	238	303	212	238	256	321
Philosophy & science.....	145	143	71	90	62	61	79	96
Nautical.....	84	51	32	15	14	22	19	41
Technical handbooks.....	228	132	103	110	104	118	123	253
Veterinary farming & stock-keeping.....	33	24	37	46	73	67	60	96
Wireless.....	23	26	17	40	34	31	20	33
Totals.....	1,753	1,307	925	1,137	960	944	962	1,434

* From Whitaker's Cumulative Book Lists, which are cumulations of the weekly and monthly book lists appearing in *The Bookseller* of London, the British book trade paper. The figures refer to books published at 6d. and over.

Similar possibilities for publishers are apparent in the report in *Nature* (April 26, 1947) of the revival in Paris, in January 1947, of the International Union of Physics. Fifteen European countries were represented, plans were made for a September 1948 meeting in Holland, liaison with UNESCO was indicated, and Commissions with personnel representing also the United States were appointed as follows: (1) Cosmic Rays, (2) Units of Radioactivity, (3) Symbols, Units, and Nomenclature, (4) Thermodynamics, and (5) Optics. Representatives were also appointed to Joint Commissions on Physicochemical Data, Viscosity, The Ionosphere, and Radiometeorology. Prof. Fleury, director of the Institut d'Optique, is secretary.

These international projects compare with similar developments in the United States. For example, there

is the new *Review of Applied Mechanics*, a project abstracting the world's literature on the subject which is to serve as a successor to the German publication *Zentralblatt*, published before the war by Springer Berlin. Sponsored by such bodies as the American Society of Mechanical Engineers, the U. S. Navy, and the National Research Council, under the editorship of Stephen Timoshenko for its initial issues, and with correspondents throughout the world, it aims to fill an important gap in a field of great importance today.

According to Edmond Segrave, editor of *The Bookseller*, British book publishers in the period 1939-1946 inclusive, reflect in the statistical record (Table 1) a trend toward technical book developments similar to that in the United States. In 1939, out of 14,904 books published, 1,753 were classed as technical and scientific. In 1946, out of 11,411, there were 1,434. The most significant gains were in the fields of engineering, mathematics, technical handbooks, and veterinary science, farming, and stockkeeping; the greatest declines, in botany, horticulture, and agriculture; medicine and surgery; and geology.¹

Over-all figures of British book production show the effects of the war. For the years 1939-1946, inclusive, these are: 14,904; 11,053; 7,851; 7,241; 6,705; 6,741; 11,411.

Shortages of labor and materials, emphasized by the fuel crisis, continue to plague the industry and cause frustration in the effort to meet the great postwar demand for new books, particularly of a technical and educational nature. Prior to the fuel crisis of last winter publishers' allotments had been increased to 90 per cent of prewar, but conditions this spring required another 10 per cent reduction. On the other hand, just as in the United States, increased book production costs, with resulting increase in prices to the public, were thought to be a probable cause of reduction in public demand and an automatic solution of the problem of shortages.

Limitations for another two years were anticipated by the president of the Publishers' Association in his annual address in March. In the quota control, the attitude toward relative value in different fields of publishing is given in the following percentages of tonnage allotments of paper in the 12-month period prior to February 1947: medical, 15; general, 14; scientific and technical, 15; educational, 30; religious and dictionaries, 11; legal, 3.

Participation of the British publishers in the national export drive is shown by the fact that in 1946 book sales abroad exceeded £5,000,000, compared to £3,000,000 before the war. Representatives of Ernest Benn Ltd., stated that British technical publishers with

¹ Since there is no standardization of publishing terminology, classification of subject matter, or as to when a pamphlet becomes a book, these and succeeding statistical materials cannot be used to compare records of production in different countries.

substantial stocks report an unprecedented world demand for British technical books.

FRANCE

The record of intellectual production to a total of nearly 9,000 volumes in 1946, or more than any year since 1938 and double the low period of Occupation in 1941, is shown in Table 2. Science and technology have maintained a steady, if not impressive, rate. The statistics, however, do not reflect the struggle to secure paper and binding materials.

TABLE 2
FRENCH INTELLECTUAL PRODUCTION*

Subject	1938	1940	1941†	1942	1943	1944	1945	1946
I General works.....	353	153	56	80	131	334	641	31
II Religious literature..	558	377	260	603	529	676	475	781
III Philosophy.....	238	158	176	325	410	367	236	359
IV Pure sciences‡.....	424	371	319	531	520	564	310	425
V Medicine‡.....	501	391	234	409	1,023	688	300	371
VI Techniques, games, & sports‡.....	1,044	882	458	803	1,272	1,361	910	1,129
VII Juridical & social science‡.....	1,140	690	530	1,050	1,227	1,080	716	1,135
VIII History & geography.....	1,158	864	558	947	998	1,053	828	1,400
IX Archaeology, fine arts.....	411	199	159	265	258	351	231	279
X Literature, language.....	2,297	1,315	1,138	955	1,550	2,206	2,341	2,982
Total.....	8,124	5,400	3,888	6,008	7,918	8,680	6,988	8,892
Translations of foreign works.....	1,056	676	119	322	130	81	190	421

* Statistics furnished by the Cercle de la Librairie.

† In occupied zone of France only.

‡ Additional figures on translations taken from the *Bibliographie de la France*, February 21-28, 1947:

	IV	V	VI	VII	Total of IV-VII	Grand total
German.....	2	1	1	3	7	49
English.....	2	1	5	6	14	237
Spanish.....	1	—	—	—	1	13
Russian.....	—	—	1	9	10	59
Total on above 4 languages..	5	2	7	18		
" " all languages.....	6	2	7	22		

Beranger, though publishing more new technical books than before the war, is concerned primarily with getting the old books back into print. In subject matter his program is about as before. There is a heavy demand for both new and old books, but high prices probably will cause reduction in circulation. The number of translations is greater than before the war.

Dunod is publishing more than before the war and exploring new fields as demands arise. Some foreign paper is purchased, but when this is allocated to a publisher, he must in turn agree to export a certain percentage of the books in which it is used.

Le Soudier reports that demands for technical books exceed supply and that new subjects are being covered. He feels that there is a strong tendency for English to become the second language in France.

At the Centre Nationale de la Recherche, where J. Wyart directs the publication of the well-known *Bulletin Analytique*, a periodical which attempts to abstract or review briefly the world's literature of science and technology, both books and periodicals, announcement has recently been made of two new journals of technical bibliographical materials: *Archives des sciences physiologiques*, edited by a committee of which G. Schaeffer is president, and *Annales de la nutrition et de l'alimentation*. The editorial committee of the latter is headed by Emile F. Terroine; the editor is Georges Kersaint. Both offices are at Centre de Documentation du C.N.R.S., 18 rue Pierre Curie, Paris 5.

It is Prof. Wyart's committee of professional people in technology which in 1946 prepared the agenda for an ideal program of translation of the best U. S. literature of industrialization. Another professional committee, selected in New York by USIBA, submitted an ideal bibliography in the winter of 1946-47, and the publishers involved thereafter forwarded to the Wyart committee sample copies and terms. Having been chairman of the original USIBA committee of publishers and responsible for the contacts in Paris in 1945, I am pleased to report that although shipping difficulties greatly delayed examination of books, work on the project is in process, and developments later will indicate whether this plan for putting large-scale translation programs in the hands of professionals is practical or whether it is better to leave to technical publishers, on the usual commercial or competitive basis, the whole question of selectivity.

SWITZERLAND

In Switzerland, an impressive record of developments in new book publication has occurred since 1938. Grand totals of 2,162 and 3,949 for the years 1938 and 1945, respectively, include for science totals of 239 and 472, or slightly more in percentage of growth than for the nontechnical fields. Officials in both publishing and bookselling believe this growth will continue. Representative of the Swiss viewpoint is the following statement by a prominent librarian in Zürich:

Since the 19th Century the printing and the sale of most of Swiss scientific literature had been in the hands of well-known German publishers. They disposed of means and organizations which enabled them to make the work of their authors popular in a far wider circle than Swiss publishers in their isolated country ever could do. Only a few authors of their international importance—for instance, the famous psychologist, C. G. Jung, or the master of modern architecture, Le Corbusier—did stick to Swiss publishers. But in most cases the powerful German publishers surpassed their modest Swiss colleagues. With the

advent of the war, things began to change. The production of Swiss books began with publication of books about law, economics, philosophy, theology, and medicine, which promised a satisfying market in their own country, as addressing themselves to a large circle of interest. During the war people came to realize that books, and especially scientific books, are a mighty weapon in the defense of independence. So the older and some of the newly-founded publishing houses in Switzerland began with a serious and vast planning of literary production also in all sections of exact and technical sciences. For 1946 the statistics are not yet available, but a further rise in quantity and quality is expected. The Swiss publishers are anxious to export a part of their production to help the international exchange of knowledge.

Among the leading Swiss publishers of technical books are the following: Verlag Hallwag A. G., Breitenrain 97, Bern; Verlag Leemann & Co. A. G., Stockerstr. 64, Zürich; Schweiz. Druck- & Verlagshaus, Klausstr. 35, Zürich; Verlag Birkhäuser A. G., Elisabethenstr. 15, Basel; Orell-Füssli-Verlag, Nüscherstr. 22, Zürich; Archimedes-Verlag, Kreuzlingen; Editions Rouge & Cie. S. A., rue Haldimand 6, Lausanne (French); and Editions Payot S. A., rue Bourg 1, Lausanne (French).

HOLLAND

In Holland, where the ravages of Occupation are outwardly, at least for the visitor, being obliterated and the industrious citizens are most actively at work to restore the national economy, book publishing is no exception to the rule. In 1938 publications totaled 6,172 and in 1939, 6,554. In 1944, only 1,847 titles appeared and in the following year, 2,436. It is officially estimated that for 1946 the 1939 total will be repeated and also that the number of translations will be increased. Statistical reports for 1939 show that, in scientific and technical subjects, total numbers of titles issued were as follows: geography, 102; physics, 199; biology, 85; anthropology, 143; physical training, 96; and psychology, 126. In 1939, in the total of 730 translated works, 421 were from the English and 144 from German sources. It is significant that in the total output of translations from other languages the percentage of those from the German was 2.2 in 1939, 12.5 in 1944, and 2.1 in 1945, i.e. after the liberation.

In 29 cities in the Netherlands there are well over 100 publishers, the number involved in technical publishing being relatively small. Muelenhoff of Amsterdam is currently publishing a series of technical manuals prepared especially for the 25,000 employees of the great Phillips works at Eindhoven, manufacturers of X-ray and other forms of electronic equipment.

Unique in Dutch publishing circles is the current appearance in English, from the press of H. Stam (Haarlem), of *Ballistics of the future*, by Kooy and Uytenbogaart, which is based on data collected by the authors at The Hague, where the Germans manufac-

tured and launched the V-2 bombs. The American edition will be distributed in early autumn of 1947.

In Holland, as in many European countries, the publishing and book-distributing organizations provide an excellent example of cartelization, in successful operation for over 100 years. Rules for pricing, converting foreign to domestic book prices regardless of bank rates permitting newcomers to establish a business, and similar controls which in the U. S. are prohibited by Federal laws are here accepted as a sound social philosophy. The conflict in their and our concepts of business ethics or business influences on a national economy provides interesting subject matter for debate.

In many respects, the Dutch show more evidence of industry and vigor in recovering from the enormously costly and tragic period of Nazi Occupation than certain other countries, and, in publishing, their record will warrant constant study.

ITALY

For the following report, I am indebted to Carlton Washburne, director of the U. S. Information Service in Milan, and his staff, including Mr. Castellani and Mr. Ferguson:

During the war all the Italian publishers, and in particular those specialized in scientific and technical publications, experienced serious difficulties. Many firms were damaged by air raids: We mention, among the most important, Hoepli and A. Vallardi of Milan, which were completely ruined; UTET of Turin and F. Vallardi of Milan, which were seriously damaged. Besides this, the shortage of paper and electric power considerably hindered the continuance of publishing, and the division of Italy in two parts (north and south of the Gothic line) further complicated the situation. As soon as the war ended, the Italian publishers immediately started supplying the country with the cultural equipment necessary for the reconstruction. Thanks to the help of the Psychological Warfare Board of the Allied Forces it was possible to overcome the initial difficulties due to paper shortage. Today paper production is almost normal, but its cost has greatly increased (about 1:63 in respect to prewar prices). At the same time (see Fig. 1) printing and other costs have increased 1:50, while the capacity of absorption of the market does not permit an increase in sale price of more than 1:35, and generally even less (25-30 times). The consequence is a considerable reduction of the publishers' profits.

It is quite natural that in these conditions the production of books has decreased in Italy. From 1938 the general total of 9,736 publications descended in 1945 to 4,068 units (the lowest figure being the total of 1,795 units for the year 1944), and though complete information on 1946 is still missing, it seems that the total of 1945 has not been surpassed. In 1945, however, the proportional number of technical and scientific books issued (1,336) marks a little progress in comparison with that of prewar years (33 per cent of the total, instead of the constant prewar percentage of 30). This fact indicates that the present demand for such books in Italy is comparatively rather higher than before.

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Among the most important books recently issued one must mention, above all, reprints of works that had become unavailable during past years as a result of war damages as well as for other reasons, i.e. racial laws, political persecution, etc. But also the publication of new works marks a satisfactory revival. . . In the total of production, translations represent a low percentage, owing to the difficulty of obtaining translation rights at satisfactory terms.

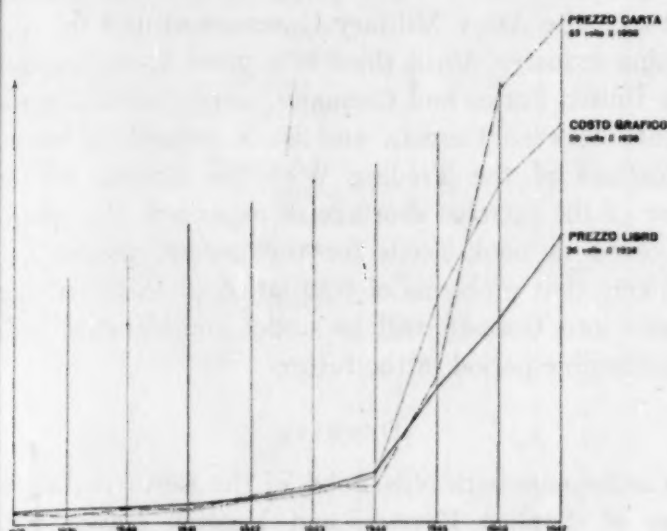


FIG. 1. Graphical presentation showing relationship of price of paper ———, cost of printing, and selling price of books ———, 1938-47 (from *Gornale della Libreria*).

The situation is much more difficult in the branch of scientific and technical reviews and periodicals. Their number has diminished considerably. A firm of Milan, which before the war published a dozen periodicals, now publishes only one.

Besides the above-mentioned firms, and other smaller but well-known publishers of technical and scientific books (like Zanichelli and Cappelli of Bologna, CEDAM of Padua, Tamburini of Milan, Pozzi of Rome, the young firm CEA of Milan, and many others), there are also large companies specializing in the sale of such books and periodicals, such as the Hoepli Bookstores of Milan and Rome and Sperling & Kupfer of Milan.

The Hoepli firm, which is in its third generation of family operation, sponsored a list of 5,000 titles before the war, 70 per cent of which were technical. All plates were lost when the entire plant was destroyed by bombs. Today the list, including 500 "restorations," totals 1,200, of which 95 per cent are technical. In attempting to meet current needs for books on construction, small manufacturing, road building, and other timely subjects, the firm confesses to the necessity of following a policy of "practical idealism" more than heretofore. Unique in use of modern technique is a new set of art books in which color photography of famous ancient frescoes reproduced by offset printing will greatly aid art and architectural students throughout the world in studying early Italian art work.

Publisher Villardi, also a victim of bombing, shows courage in investing, under the circumstances, in a new 7-volume work on building construction.

SWEDEN

Extensive industrial utilization of scientific research is an outstanding current development in Sweden, and plans for publication of results in monograph form were recently announced by Ely Velander, chairman of the Royal Swedish Academy of Engineering Research.

Acta Polytechnica is the name of the new periodical and, since it will be published in English, French, and German, world-wide circulation is planned. As a non-profit enterprise, its circulation will be largely on an exchange basis. It will aim to present the most important contributions made by Swedish scientists in engineering research. Unique among its features will be inclusion of library index cards. This development is part of a large national plan, sponsored by the government and in process of organization since World War I, for providing a technical information service on a large scale. It would seem to command definite interest on the part of technical editors and librarians throughout the world.

Of the 5,298 books published in Sweden in 1939, 2,284 were technical, medical, and scientific. In 1945 the total was 5,509, including 2,319 in these categories.

Outstanding in current technical book publishing is the appearance of the Swedish edition of the 5-volume engineering handbook, *Hütte*, edited by A. C. Stromberg and published by Nordisk Rotogravyr. An edition of 7,000 copies at \$10.00 per volume, excellently printed and bound, is a splendid example of publishing courage for a market that is relatively limited.

In the outstandingly attractive bookshops, in the extensive library of the Polytechnic High School, and from second-hand information about the various research laboratories in Stockholm and Upsala, it was clear that since World War II American technical book authors have firmly established themselves where formerly German authors were predominant.

BELGIUM

An orgy of spending immediately following the liberation resulted in overexpansion of book publishing and distributing facilities in Belgium, and the necessary rebound is affecting book publishing. Since few technical books are produced here, the authors preferring French imprints, since the trade association has no statistical information, and since registration of new books is not required as in other countries, our report is comparatively valueless.

POLAND

Although Warsaw was not visited on this trip, we are indebted to the March 29 issue of the *Bookseller* (London) for the following information on Polish book production last year. As will be seen, over one-third of

the new titles are in the several branches of science and technology:

Book production in Poland during 1946 totaled 3,248 titles. Although this figure is only 51 per cent of the 1937 total, it nevertheless represents a remarkable achievement, if the technical difficulties and the shortage of paper and plant are taken into account. The 3,248 titles have been classified as follows:

Books on general subjects	170
Philosophy	44
Religion	235
Social science	708
Languages and philology	29
Science	83
Technology	444
Art	164
Belles Lettres	600
Children's books	330
History and geography	320
Textbooks	121

What the category "Books on General Subjects" contains is not clear, and it seems rather odd that the classified statistics, which are official ones, make no mention whatever of fiction.

The publishers have been divided into the following classes:

- (1) Publishing Cooperatives (Ksiazka, Czyteknik, Wiedza, Nasza Ksiegarnia and others), 550 titles.
- (2) State publishing institutes, 712 titles.
- (3) Social organisations, trade unions, etc., 572 titles.
- (4) Private publishing firms, 1,414 titles.

CZECHOSLOVAKIA

Conditions of restoration in Prague are different from those in any other country visited. An official of the Ministry of Information reported that in 1946 approximately 8,000 titles were published, but the percentages of technical books and of pamphlets were not indicated. The great total was due to the fact that, during the 6-year "blackout" (1939-45), nothing was published, and since only a few books appeared in the period 1934-39, an enormous thirst and backlog was created. It was assumed that in 1947 the total would equal that of the preceding year.

With new publishing permissible only on government licenses for each book, conditions are far from normal in the opinion of an American publisher. Furthermore, with Russian the official second language, as a substitute for the German to which the adult population is, of course, well accustomed, there is for the time being some difficulty in the training of the younger generation.

In the Ministry of Education and among native industrialists and several active book dealers it was evident that educational and scientific literature from the United States was in active demand among the Czechoslovakian people.

GERMANY

Technical publishing in Germany has been discussed with respect to chemical literature by Rogers Adams (*Chem. eng. News*, February 25, 1946, p. 454; March 25, 1946, p. 790).

My brief visit to Gen. Clay's headquarters on June 1, 1947, permitted discussion only of general policy on translations from English and contractual relations between the Army Military Government and the publishing industry. Until there is a peace treaty between the United States and Germany, direct financial agreements between German and U. S. publishers become violations of the Trading With the Enemy Act. In view of the extreme shortage of paper and the priority involved in book needs for the general public, it is unlikely that problems of translation of U. S. technical books into German will be under consideration for a considerable period in the future.

DENMARK

Conferences with Nils Bohr, of the Research Laboratory of Applied Physics, and Henrick Dam, of the Biological Laboratory of the Technical High School, indicated that these men, both holders of the Nobel Prize, were definitely interested in my report of attempts to develop, through both memberships in professional societies and the exchange of literature, closer relationships between Danish and U. S. scientists.

Another interesting development was in meeting Ejnar Munksgaard, publisher of the famous Facsimile Series of volumes containing reproductions of original manuscripts dealing with early periods of civilization. The object of these volumes is not only to make accessible to researchers the chief literary sources but also to preserve them in the best reproductions it is at present possible to produce, should a catastrophe occur.

Publications emanating from research work in pure and applied science in Denmark, as well as volumes reflecting the developments in the social sciences in this part of the world, are providing an important new literature.

In providing the accompanying table of scientific book production for Denmark (Table 3), Dr. Munksgaard added the following statement:

As to the extent of publishing scientific works in English, it is a rather difficult question. Nearly all scientific Danish papers have a summary in foreign languages, either English or German, if they are published in Danish. This has always been the rule. I should say that there is a definite tendency to publish in a foreign language in order to give the book a wider scope.

He comments on the influence of paper shortage and labor difficulties as follows:

The lack of paper during the past years has certainly influenced the output of books in a decisive way. In 1947 the

output will be even smaller because of the strike of the typesetters which has now lasted for three months. All the planned books in either English, French, or German—about 90 per cent

TABLE 3
SCIENTIFIC WORKS* PUBLISHED IN DENMARK

	1939	1940	1945	1946
General works on books, bibliography, library economy, archives...	5	8	10	10
Encyclopedias, collected essays, periodicals, societies, museums...	8	12	11	7
Philosophy (logic, psychology, ethics, philosophy of religion, history of philosophy, history of science)....	7	8	10	10
Religion (bible, dogmatics, mission, history of Christian Church, Christian Churches and sects, non-Christian religions).....	26	15	15	17
Social science in general, statistics, political science.....	9	7	4	15
Insurance and public aid.....	3	3	2	16
Economics.....	16	15	9	13
Law.....	23	15	15	23
Administration.....	1	0	1	1
Education.....	10	7	8	6
Folklore.....	11	12	4	5
Geography and topography.....	53	54	46	45
Reports of the Greenland Administration.....	32	18	14	16
Pure science.....	2	4	2	4
Mathematics.....	2	5	9	5
Astronomy.....	4	4	5	8
Physics.....	4	7	21	15
Chemistry.....	4	7	3	6
Geology, meteorology, hydrography..	14	15	12	10
Biology.....	17	8	8	5
Botany.....	11	15	3	16
Zoology.....	14	20	18	14
Ethnography.....	1	1	0	3
Medicine.....	59	48	56	58
Agriculture (incl. reports from the State Research Laboratory).....	53	38	32	36
Useful arts (engineering, trade, business, chemical and mechanical technology).....	10	19	16	15
Fine arts (architecture, sculpture, painting, engraving).....	11	5	10	14
Theatre and music.....	6	8	4	4
Literature (general and single countries).....	32	29	20	19
Philology.....	13	11	7	10
History.....	31	20	21	23
	492	438	396	449

* Only scientific works in the strictest sense are included.

in English—will be printed, however, so that 1948 will be a record year as regards publication, as the typesetters cannot go on striking indefinitely.

NORWAY

Publishing in Norway is distinctly for the large number of works in English. A unique feature of one of the new books by Tanum is the inclusion, in a series of vertical marginal notes for the Norwegian whose bilin-

gual ability is limited, of the translation of key words.

Mr. Moller, of the Tanum store, and Mr. Raabe, of Cammermeyer's, publishers as well as operators of two outstanding book distribution agencies of the Scandinavian countries, are well known to American publishers and distributors. It is their opinion that, until Norwegian authors have been able to complete research work which was stopped during the war, there will be few original technical manuscripts for publication. Similarly, Norwegian publishers are operating under a handicap due to paper rationing, shortage of labor, and worn-out machinery.

Secretary Harald Aars, of Den Norske Forleggerforening, Oslo, reported book production, prewar and current, as follows: 1938: of 1,233 titles, 16 technical; 1939: of 1,429 titles, 25 technical; 1945: of 1,437 titles, 26 technical; and 1946: of 1,893 titles, 21 technical. He did not qualify as to the scope of the phrase "technical," and it is assumed that books in the social sciences were not included. He did add that the books included above are only such books as are ordinarily sold through bookstores. Children's picture-books and stencil-printed books are excluded, as are periodicals and their reprints, unless they appear as independent books. He states, on the other hand, that "annals" are included.

CONCLUSION

It is regretted that the inadequacy of the techniques of collecting data with respect to reports on both Denmark and Norway deprives the readers of *Science* of information about the vast and inspiring programs of research and publication which are developing in all the Scandinavian countries. There is in process in both social and physical sciences a new literature which should be of definite interest in America. For example, socialized medicine, on which we in the United States are continuing an important debate, has been a fait accompli in at least two of these countries for a number of years. The results, from the viewpoint of both doctors and patients, would undoubtedly be of great interest to all involved in the American debate.

In this survey of developments in 11 countries, it is significant that the words "research" and "education" appear so regularly. It is my opinion that, in this phase of the world revolution in the social as well as physical sciences, all publishers should utilize all possible agencies, including libraries and book distribution agencies, to accelerate to the best of their ability translations of the best of the important resulting literature. The maximum distribution of translations of important contributions in the sciences as an adjunct to the new programs in education should help to raise the standard of living throughout the world.

Scientific Publishing in Continental Europe:

Notes on Its War and Postwar Status

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SINCE 1940, MANY AMERICAN SCIENTISTS have been handicapped in their research activities by the lack of definite information concerning the publication and availability in this country of scientific periodicals emanating from Axis and Axis-controlled countries, especially Germany. Some abstracts of articles published in Continental European journals for the war years appeared in *Chemical Abstracts*, *Biological Abstracts*, and other similar journals, but the coverage was far from complete, and often copies of the periodicals abstracted could not be located in the United States. Since scientists in most disciplines have been concerned chiefly with periodical and monographic publications, especially those published in Germany, this article emphasizes such serial publications. The number of scientific and technical journals published in Germany before the war was far larger than that of all other countries of Continental Europe combined.

In 1943 the Library of Congress issued a finding list of journals published in Axis and Axis-controlled countries in 1940-43 which contained many gaps; some periodicals known to have been published were not even listed. For Germany, lists of wartime publications have now become available. Copies of *Halbjahrsverzeichnis* for the years 1941-43, inclusive, were reproduced photographically by J. W. Edwards, Ann Arbor, Michigan, as were copies of *Deutsche Nationalbibliographie* for 1944. These volumes, now obtainable at many libraries, list scientific books and, to some extent, the individual numbers of scientific periodicals published in Germany during the years covered. In 1945, the publication of scientific books and periodicals practically ceased. During the latter part of 1946 and the early months of 1947, some scientific journals resumed publication, and a few new journals were started.

A purchasing mission under the auspices of the Library of Congress, organized in 1946, was able to obtain copies of certain scientific journals published during the war and postwar years. These issues, which are being shipped to a few American libraries assigned priorities by a national committee, will by no means be sufficient in number to satisfy the demand or even to furnish copies to libraries on the priority list. One library with priorities in physics, chemistry, botany, zoology, veterinary medicine, and animal culture has so far received as a result of

the Library of Congress Mission only three or four issues of scientific journals published in 1946-47. Nevertheless the work of the Mission will ensure the availability somewhere in this country of copies of scientific journals which later can be used for photographic reproduction if necessary.

A group of librarians has proposed a project which will indicate the location of all issues of periodicals published in Axis and Axis-controlled countries during the war years. The publication of such a much-needed list may have to await the publication of a second Supplement to the Union List of Serials. Sufficient information to justify the compilation of the list will not be available for many months. In the meantime, the Library of Congress is maintaining a card index showing the location of all copies of war issues of periodicals known to have been received from those countries.

Until the last few weeks, American librarians were unable to place orders for current German publications. In February of this year, the firm of Stechert-Hafner received permission from the Office of Military Government for Germany (U. S.) to send a representative to Germany to arrange for the purchase and shipment of the books and periodicals available there. The first shipments are now en route. It is probable that other American and foreign dealers will soon receive permission to send representatives to Germany to make similar arrangements. In so far as is known at the present time, no dealer except Stechert-Hafner has yet received such permission. Correspondence directly with German dealers and publishers to secure information as to titles, quantities, and prices may be conducted, but financial transactions must be cleared with the U.S.-U.K. Joint Import-Export Agency, Melitta House, Minden, Westphalia, British Zone, and remittances made as directed by that agency and not directly to German dealers. Under the Trading With the Enemy Act, orders involving financial commitments cannot at present be sent directly to any German publisher or dealer.

Some lists of Germany scientific periodicals are becoming available. The latest, compiled in part by Ferdinand Springer, of the firm Julius Springer, appeared in the April 15 issue of Stechert-Hafner's *Book News*¹ and

¹ Obtainable from Stechert-Hafner, Inc., 31 East 10th Street, New York City.

includes the titles of 177 scientific and technical periodicals classified as follows:

Natural Sciences.....	14
Physical Sciences, including mathematics, physics, chemistry, and pharmacy.....	24
Medicine and Public Health, including physiology.....	63
Technology.....	43
Agriculture and Forestry.....	10
Economics and Law.....	23

The list obviously should be revised and supplements published at frequent intervals. Letters from German publishers indicate that plans are now being made for many additions to the list already announced. Springer writes that he expects to resume publication of his many abstracting journals as soon as communications are re-established. Indeed, it is reported that a new volume of *Beilstein's Handbuch der organischen Chemie* is now ready for publication.

The Stechert-Hafner list is probably not complete. A correspondent from Germany mentioned, possibly inaccurately, the revival of *Zeitschrift für Kristallographie*, which is not included. However, a comparison of lists received from German scientists indicates that the Stechert-Hafner list is reasonably complete as of February 1947. In general, it does not contain publications of universities and learned societies, and it seems probable that universities and scientific societies have not yet resumed publication.

An earlier, more general list of periodicals appeared in the German publication, *Kultur-Archiv*, for October-November 1946. *Kultur-Archiv* apparently is a section of *Europa-Archiv*—not to be confused with other publications of a similar name. The "Europa" list, which contains a few titles of agricultural and technical periodicals not included in the Stechert-Hafner list, is of more value to humanists than to scientists.

On the Stechert-Hafner list, over half of the titles represent revivals of earlier periodicals. In some cases, titles have been changed. The *Berichte der deutschen chemischen Gesellschaft*, for example, is now known as *Chemische Berichte*. The extent of the resumption of publication of German scientific and technical periodicals is indicated by a check of the periodicals received by one library before the war with those in the Stechert-Hafner list. Of 409 scientific and technical journals, not including medical, of which issues were received in 1939, only 37 appear on the present list. The list however, contains many old friends, such as *Pflüger's Archiv*, *Liebig's Annalen der Chemie*, *Zeitschrift für analytische Chemie*, *Annalen der Physik*, *Hoppe-Seyler's Zeitschrift für physiologische Chemie*, and *Mathematische Annalen*. Revivals in the pure sciences are few in number compared with those in medicine. Revivals in physiology, which include some outstanding journals, are listed under Medicine in the Stechert-Hafner list. Only one

botanical periodical, *Planta*, appears. During the war, medical, agricultural, and industrial periodicals seemed to have been given priority. During the occupation, a very considerable number of periodicals in the field of religion and theology arose, possibly, in part, as a reaction to the strict censorship existing during the Hitler regime.

It is too early to evaluate the content of the German scientific publications of 1946-47. During the Nazi regime, the value, from a scholarly standpoint, of publications in ethnology and the social sciences almost disappeared, although these publications are of some value in indicating ideologies and the mental reactions of the German sociologists and ethnologists remaining in Germany during this period. In the field of the pure sciences, however, many articles in German scientific periodicals published during and after the war are being eagerly requested by scientists and are reported to contain articles of first importance—not, however, on a scale comparable as to quantity or quality to articles published in Germany in earlier years. In many disciplines, the deterioration can be traced back to the first years of the Hitler regime. Evaluation of the periodicals which have recently started publication in Germany is not possible at present, since few, if any, copies are available for examination.

Many current bibliographic publications are now available. The issues of *Deutsche Nationalbibliographie*, published at Leipzig, are a "must" for all American research libraries. Theoretically, this periodical lists all currently-issued German publications, but since it is published in the Russian zone, some German publishers in the western zones may not desire to send as complete information of their publications to Leipzig as formerly. A tendency to separate the publishing activities of the western zones of Germany from those of the Russian zone has developed, possibly because of the different publishing restrictions prevalent in the various zones. The well-known *Börsenblatt für den deutschen Buchhandel*, published in Leipzig, represented before the war the entire book trade of Germany. A new periodical under the same title, published at Frankfurt am Main, in the American zone, represents the book trade of the western zones. In addition, a periodical entitled *Mitteilungen für den Buchhandel in der französischen Zone* is being published in Freiburg, in the French zone, and one with a similar title, published at Munich, represents the book trade of Bavaria in the American zone.²

² After this article was in proof, word was received from Germany of the publication in Frankfurt of a periodical entitled *Bibliographie der deutschen Bibliothek*, which duplicates to a considerable extent the material contained in *Deutsche Nationalbibliographie*. Another illustration of the unnecessary duplication of German bibliographic periodicals is the recently announced publication of two periodicals both known as *Chemisches Zentralblatt*, one published in Berlin in the Russian zone, the other in Heidelberg. Both of these periodicals continue the volume number of the original publication.

Committees of the American Chemical Society and the American Library Association are studying the unnecessary duplication of bibliographical periodicals, apparently caused by the rivalry of publishers in the Eastern and Western zones of Germany.

Conditions in Germany are not favorable to scientific publishing. The Armies of Occupation in the various zones have issued rigid, but differing, regulations. Each publisher must acquire a license, which is subject to revocation. The greatest hindrance at present, however, is the lack of paper. One German publisher reports that he has been able to obtain only 10 per cent of the paper stock needed. Furthermore, since Germany is still technically at war, any German scientific publication theoretically may be reproduced photographically in another country and sold at a reduced price. Hence, some manuscripts are being held until assurance is received that copyright will again be enforced.

The prospects for the acquisition of war issues of German scientific books and periodicals are not good. The stocks of many scientific publishers, including those of Julius Springer and Akademische Verlagsgesellschaft, have entirely disappeared. The book trade journals previously listed include many pages of advertisements for wanted publications. The chief hope of American libraries for completion of sets of German war periodicals depends on cooperative plans for photographic reproduction, now being discussed. Even the postwar issues, because of their limited editions, are becoming difficult to obtain. Scientists and librarians who desire any of the periodicals on the Stechert-Hafner list should place their orders immediately. Even now, it is too late to obtain readily issues of some journals published in the fall of 1946.

German publishers, in general, prefer the western zones. Some of them, notably Julius Springer, have established offices in several cities. One publisher writes that he desires to relate his publishing activities to the scholarship and research of the "Western World" scientists and hopes to place his scientific journals on an international basis. Undoubtedly the restrictions on Russian publishing and exports account in part for this point of view. Some consideration is being given to issuing some scientific publications in both the English and, the German languages. In the minor countries of Europe, several periodicals contain more articles in the English language than was the case before the war. The titles and content of some periodicals, more popular than scientific, are of interest as indicating a point of view. The British and American influence is revealed by such titles as *Neues Abendland*, *Neues Vaterland*, *Stimmen der Völker*, *Volksmacht*, and *Zeitwende*.

The war has brought about a shift of many publishing activities from Germany to Austria, Switzerland, Holland, and the United States. New publications have started in these countries which may replace older German serials and monographic works. Publications of such firms as Elsevier Publishing Company (Amsterdam and New York), Academic Press (New York), and S. Karger (Basel) are examples.

In France, scientific publishing never entirely ceased

as it did in Germany and, after the liberation, was much more quickly resumed on a prewar basis. Of 93 French scientific periodicals, excluding medical, received by one library before the war, at least 46 are now being published. Of 55 publications of societies and universities, 33 are now being issued. Some of the most notable are the following, well-known to scientists in the various disciplines: Académie des Sciences, *Comptes Rendus*; *Annales de Chimie*; *Archives de Biologie*; *Archives d'Anatomie Microscopique et de Morphologie Expérimentale*; Institut Pasteur, *Bulletin*; *Journal de Chimie Physique*; *Journal de Physique et la Radium*; *Journal de Mathématiques Pures et Appliquées*; and Société de Biologie, *Comptes Rendus*. The subscription prices have been greatly increased, in some cases as much as 8 or 9 times the prewar price. French periodicals which apparently are not being published include such publications as *Annales de Physiologie*; *Matières Grasses*; *Revue de Chimie Industrielle*; and *Revue Générale des Matières Colorantes*.

In proportion to the number of prewar periodicals, France seems to have emphasized somewhat more than has Germany publications in the pure and natural sciences. On the other hand, not so great emphasis seems to have been given by France to publications in technology and medicine. Possibly the need for increased agricultural and industrial production was more keenly felt in Germany.

There is great need for a comprehensive list of current French scientific periodicals as well as a list of discontinued titles, with volume and number of the last issue published. Any dealer except an enemy alien can arrange for importation of books from France and other European countries, with the exception of Germany.

Italy, as was to be expected, has been slow in the resumption of publishing activities. With the exception of publications of institutions, few periodicals in the pure and natural sciences published before the war have reappeared. Among the casualties are the well-known publications of the Naples Zoological Station; *Rendiconti* of the Circolo Matematico di Palermo; *Bollettino* and *Memorie* of the Società Entomologica Italiana; and *Clinica Veterinaria*. The list could be greatly extended. On the other hand, *Annali di Chimica Applicata*; *Annali di Matematica*; *Annali d'Igiene*; *Archivio di Fisiologia*; *Bollettino* of the Istituto Sieroterapico Milanese; *Bollettino* of the Unione Matematica Italiana; *Giornale degli Economisti*; *Rivista di Biologia*; *Scientia*; and *Bollettino* of the Società Italiana di Biologia Sperimentale have been resumed. Unconfirmed reports have been received of the resumption of publication of the highly-esteemed *Memorie* of the Reale Accademia dei Lincei.

Appeals are being received daily from Italian academies, universities, and experiment stations for a resumption of exchanges with American institutions. Most of these letters bemoan the fact that, unfortunately,

the would-be recipients although hopeful of resumption of Italian publications at some future date, have nothing at present to offer in exchange. Most of the universities in Italy, as well as in many other countries, have received no American publications for the last five or six years and are naturally eager to obtain foreign scientific publications issued during that period. Because of financial conditions, purchases are not possible. Shipments by the American Library Association and the American Book Center have necessarily been limited chiefly to allied and neutral devastated countries.

A majority of Austrian scientific periodicals have now resumed publication, but these never compared in number with those issued in Germany or France. Lists from such dealers as Urban and Schwarzenberg and Springer Verlag, in Vienna, are obtainable from any American importer. It is reported that some periodicals formerly published in Germany are now published in Vienna. Not many such cases could be found, with the exception of periodicals published by firms with offices in both countries. Some periodicals, such as *Mikrochemie*, formerly issued by Springer in Berlin, are now being issued by Springer in Vienna. Among the typical Austrian periodicals which can be obtained through any dealer except an enemy alien are: *Monatshefte für Chemie*, *Wiener botanische Zeitschrift* (formerly *Oesterreichische botanische Zeitschrift*), *Wiener klinische Wochenschrift*, and *Wiener tierärztliche Monatsschrift*.

A number of new journals have started publication in Austria, chiefly in Vienna, but these are concerned more with industry and building than with the sciences. *Oesterreichische Bibliographie*, now available at many libraries and from any importer, lists periodicals, but cites titles of periodicals in lists of books under subject classification. Such citations are not convenient for checking by American libraries for ordering purposes. The compilation of lists of scientific periodicals now being published in Austria is desirable. The revival of publication in Austria, as in Germany, seems to be much more extensive in the field of the humanities and in medicine than in the sciences.

The Viennese book trade journal, entitled *Anzeiger für den Buch-, Kunst- und Musikalienhandel*, is of value to librarians and scholars interested in Austrian publications, partly for the information it gives concerning publishing activities. Advertisements of Swiss, British, and American books appear. One dealer lists for sale *Benjamin Franklin*, *Yankee from Olympus*, and *George Washington Carver*. Another advertises that he has just received copies of the journal *Britain today*. If the *Anzeiger* represents accurately the thinking of the Viennese, Austria, or at least Vienna, is also looking toward the West for the resumption of its cultural relations.

Reports from Russia are most discouraging and, in some cases, conflicting. Many Russian periodicals cannot be exported. A list entitled *1947 Periodica U S S R*,

obtainable from any importer, contains the titles of 202 periodicals, chiefly scientific, which are available for export. Reports indicate that the Russian Government may forbid at any time the export of single issues of any periodical. It is therefore difficult, if not impossible, for a library to obtain complete volumes of any Russian serial, although in some cases the missing issues may have been obtained through personal channels. Some scientists have reported that, through personal correspondence with their colleagues in Russia, they have been able to obtain numbers of periodicals not available for export. Institutions having publications to offer on exchange have found that Russian academies and societies have been liberal in exchanging their publications.

Even less information with regard to scientific publications can be obtained from the Russian satellite countries than is available from Russia. Probably the most valuable scientific publications received before the war from Poland, Rumania, and Bulgaria were issued by universities and learned societies. At present not much is known definitely of the revival of any of these publications. The little information which has been received came as a result of personal correspondence. Requests for information on the availability of scientific periodicals in the Russian satellite countries have not met with entirely satisfactory responses. Undoubtedly, more information will be available within the next year or two. Especially in the case of both Russia and her satellite countries, the chief hope seems to lie in the eagerness of institutions and societies in these countries to receive American publications on exchange. This fact has much significance, not only for the acquisition of their scientific publications but also as a means of developing cultural relations with countries with which international understandings are most desirable.

Letters have been received from Czechoslovakia requesting exchanges, but few Czechoslovakian publications seem to be available for such purposes. It seems probable that scientific periodicals have not been revived or started to any considerable extent. One noted exception, however, is the valued *Collection des Travaux Chimiques de Tchécoslovaquie*, which ceased publication in December 1939 and resumed in 1947. The volume numbers indicate that no issues were published for the 7 intervening years.

Note should be made of the great increase in the publication of scientific books in Switzerland. The transfer of German periodical publication from Germany to Switzerland, anticipated by so many, apparently has not taken place, but several anti-Nazi scientists who formerly contributed to German medical periodicals are now found as contributors to similar Swiss publications.

Scandinavian, Belgian, and Dutch publications are rapidly returning to the prewar basis. Many of the scientific publications never suspended publication, although issues were somewhat irregular. Libraries quite

generally are now able to obtain complete files of the scientific and technical journals received before the war.

As Continental Europe recovers from the war, and as more paper stock becomes available, scientific publishing should be resumed on a greatly increased scale. Avenues of communications are now being opened. The development of exchanges of scientific publications is most de-

sirable; closer relations between American scientists and those of foreign countries will make the international exchange of scientific information more widespread than would be possible if the exchanges were on an entirely commercial basis. American scientists, together with our academic institutions, can contribute much to the future peace of the world.

NEWS and Notes

On July 15 the steel ketch *Atlantis* sailed from Woods Hole, Massachusetts, its destination being the mid-Atlantic Ridge, some 1,200 miles east of Bermuda. On board were Maurice Ewing, of Columbia University, and a corps of assistants, who will survey the topography of the Ridge and attempt to discover the character of its rock and the nature and depth of its sedimentary covering. From the data accumulated by the expedition, which is sponsored by the National Geographic Society, Columbia University, and the Woods Hole Oceanographic Institution, these scientists hope to ascertain how and when the Ridge was formed.

The Ridge, with peaks rising over two miles above the ocean floor, stretches from Iceland almost to Antarctica. The depth of the portion under survey will be measured by echo-sounding—recording the time required for a sound wave produced at the ship to travel to the ocean floor and back, and utilizing the velocity of sound in water to calculate the distance to the bottom. In addition, cross sections of sediment will be collected by means of 10-foot-long steel tubes equipped with 850-pound lead weights, which will be dropped over the side. By this means the ages of the various layers may be determined and changes in the earth's magnetic field may be shown. But

these cores will sample only the most recent portion of the sediment. To determine the entire thickness sonic measurements will be used. Still another interesting piece of equipment is the Nansen bottle, which, when lowered, fills with water at any desired depth, water from other levels being kept out by a series of valves. These bottles enable the study of microscopic life and salinity far below the surface. A special under-sea camera perfected by Prof. Ewing and his students will also be used.

Reservations are available for several of the Chemical Research Conferences sponsored by the AAAS and being held this summer at Colby Junior College, New London, New Hampshire. Increase in facilities at the College has permitted a larger attendance than in previous years at Gibson Island.

Conferences for which reservations are available are: Medicinal Chemistry, July 21-25; Vitamins, July 28-31; Food and Nutrition, August 4-8; Cancer, August 11-15; and Instrumentation, August 18-22. Requests for attendance should be addressed to W. George Parks, Colby Junior College, New London, New Hampshire.

The final program for the Conferences was published in the May 2 issue of *Science*.

A National Science Foundation bill, H.R. 4102, introduced into the house by Rep. Wolverton of New Jersey on July 7 and reported out by the Committee on Interstate and Foreign Commerce, is scheduled for debate on the floor as *Science* goes to press. This bill, although carrying essentially the same provision as

S. 526, stipulates that the director shall be appointed by the Foundation of 24 members instead of being appointed by the President after consultation with the Foundation and approval by the Senate (see *Science* May 30). The bill omits specific mention of the social sciences and allotment of research funds to states. It authorizes establishment of special commissions on cancer research, heart and intravascular diseases, poliomyelitis, and such others as deemed necessary. Its patent provision prohibits individuals from obtaining patents for any invention resulting from their activities with the Foundation. Such individuals may, however, apply for patents to be assigned to the government or its nominee.

About People

E. A. Vuilleumier has resigned as dean of Dickinson College, Carlisle, Pennsylvania, in order to devote full time to his professorship of chemistry. Dr. Vuilleumier, who has been head of the Department of Chemistry since 1920 and dean since 1933, will be succeeded by Russell I. Thompson as dean.

Lorus J. Milne, who since 1942 has been working in the field of aviation medicine at the Johnson Research Foundation, University of Pennsylvania, has been appointed associate professor of zoology at the University of Vermont, effective in August.

J. H. Quastel, British scientist known for his work in enzyme chemistry, has been appointed professor of biochemistry at McGill University and associate director of the Montreal General Hospital Institute for Special Research and Cell Metabolism. Dr. Quastel will also serve as director of the enzyme research division of the Institute.

George W. Snedecor, director, Iowa State College Statistical Laboratory, since its establishment in 1933, and a member of the mathematics staff since 1913, retired from administrative duties July 1 but will continue as professor of statistics and as consultant to the Laboratory.

Grants and Awards

Iowa State College has been given a grant of \$300 from the China Foundation for reproduction of scientific articles for Chinese scholars, who have received almost no scientific publications from western countries since the beginning of the war. The Iowa State Library will direct the work of reproduction.

At the annual dinner of the American Institute of Nutrition, May 19, in Chicago, the Borden Award for 1947 was presented to L. A. Maynard, director, School of Nutrition, New York State College of Agriculture, Cornell University, for his significant contributions, both to the field of general nutrition and to the knowledge of the physiology of milk secretion, of factors affecting milk production and milk composition, and of the requirements of animals for dietary fats. The Mead Johnson and Company Award for Research on the Vitamin B Complex was given to William J. Darby, associate professor of biochemistry, Vanderbilt University School of Medicine, Paul L. Day, professor of physiological chemistry, University of Arkansas School of Medicine, and E. L. R. Stokstad, research chemist, Lederle Laboratories, for their discoveries and investigations in the field of the B-complex vitamins with special reference to their studies on the chemical nature and nutritional significance of folic acid.

At the 37th annual meeting of the American Society for Pharmacology and Experimental Therapeutics, held May 18-22 in Chicago, the John J. Abel Prize in Pharmacology was awarded to George Sayers, assistant professor of pharmacology, School of Medicine, University of Utah, in recognition of his paper, "The Pituitary-Adrenal System." The prize, of \$1,000 and a bronze medal, plus traveling expenses up to \$150, is awarded to a young man or woman working in a college or university by Eli Lilly and Company, for the purpose of stimulating fundamental research in pharmacology in the United States and Canada.

The Order of the White Lion was awarded to 17 Americans, June 3, in recognition of their services to Czechoslovakia last year. The awards were presented by Dr. Juraj Slavik, Czechoslovak Ambassador to the United States, on behalf of his Government, to the following members of the Unitarian Service Committee Medical Teaching Mission: Paul Dudley White, Harvard Medical School; Alexander Brunschwig, Cornell University College of Medicine; Ralph Waldo Gerard, University of Chicago; Emery A. Rovenstine, New York University College of Medicine; L. Emmett Holt, Jr., New York University College of Medicine; Leo M. Davidoff, Columbia Medical School; Colin Munro MacLeod, New York University College of Medicine; James E. M. Thompson, president, American Academy of Orthopaedic Surgeons; Joseph Charles Aub, Harvard Medical School; Joseph Francis Volker, Tufts College Dental School; Otto Krayner, Harvard Medical School; Joseph Peter Lazansky, Tufts College Dental School; Milan Alexander Logan, University of Cincinnati College of Medicine; Everett Dudley Plass, University of Iowa Medical School; Kenneth D. Miller, president, New York City Mission Society; and Mr. and Mrs. Waitstill H. Sharp, Boston.

The Heyman Prize, awarded every three years and alternating between literature and science, has this year been awarded to Docent Börje Kullenberg by the Göteborgs Högskola, in recognition of his distinguished work in constructing the piston core-sampler, which affords means for a new departure in submarine geology. The sampler was used very successfully during the *Skagerak* expedition to the western Mediterranean in the spring of 1946 and will be utilized also in the forthcoming Swedish deep-sea expedition with the *Albatross*. In 1941 the first science award was divided between Helge Backlund and Lennart von Post, eminent geologists.

Colleges and Universities

The Agricultural and Mechanical College of Texas has established a Department of Biochemistry and Nutrition which will include work and staff members that have previously been in three different departments. Paul B. Pearson, of the Nutrition Laboratory, has

been named head of the new department, which will become effective September 1.

New York University and Stevens Institute of Technology will jointly sponsor a new fluid dynamics program, to be opened in September. The course in fluid dynamics of aircraft, ships, and related bodies, inaugurated by the Graduate School of Stevens and the Graduate Division of the College of Engineering, New York University, will make possible a combination of theory and experimentation through the use of the wind tunnels at the Daniel Guggenheim School of Aeronautics and the towing tanks of Stevens.

Coordinated courses in mathematical methods, theoretical and applied hydro- and aerodynamics, experimental methods, and high-velocity gas dynamics will lead to a Master's degree. Enrollment in the course is limited for the first year to 15 students, chosen by the two colleges on the basis of the student's individual record.

The Institutum Divi Thomae, Cincinnati, Ohio, founded in 1935 as a graduate research school open to all scientists regardless of race, color, or creed, has recently received from the Donner Foundation, Inc., a \$150,000, 64-room building located in Palm Beach, Florida. The building, to be known as Donner Hall, will provide quarters for what is planned to be the largest marine biophysics laboratory in the world, for fundamental cancer research, and for visiting scientists who will be participating in various symposia.

At the 75th anniversary commencement of the University of Arkansas on June 9 Lewis Webster Jones, formerly president of Bennington College, was inaugurated president. Among those receiving the LL.D. degree was A. F. Blakeslee, of Smith College.

Summer Programs

The Maxwell Graduate School of Syracuse University has announced that during this summer it is sponsoring the Social Science Field Laboratory, conducted for over 10 years at Ukiah, California, by B. W. Aginsky, chairman, Department of Sociology and Anthropology, College of the City of New York, and Ethel Aginsky, Department of Anthropology, Hunter College. The program, sponsored by New York University

from 1938 to 1941, was suspended during the war. The full program, now resumed, includes special research training for eight selected advanced students from several universities. Although originally focused on the anthropological study of the Pomo Indians, it has now been broadened to include studies of the entire community of Ukiah and neighborhood, involving coordination and integration of all of the various social sciences. Its new official name is The Social Science Field Laboratory Institute Under the Auspices of the Maxwell Graduate School of Citizenship and Public Affairs. The director is B. W. Aginsky; the associate director, Ethel Aginsky; and the assistant director, Alfred P. Parsell, who teaches sociology at Hunter College.

Industrial Laboratories

Sharp & Dohme, Inc., announces that Karl H. Beyer, director of pharmacological research, Medical Research Division, sailed for England July 11 for a meeting with Sir Alexander Fleming, discoverer of penicillin, to discuss "Statin" Caronamide, his own discovery, and to attend the International Physiological Congress, Oxford University, July 21-25, where he has been invited to speak. Dr. Beyer also plans to attend the British Pharmacological Society Meeting, University of London, July 26.

Smith, Kline & French Laboratories have announced the association of Ivan H. Witt with the Organic Chemistry Section of their Research Department. Dr. Witt was formerly associated with the B. F. Goodrich Company.

G. H. A. Clowes, director emeritus, Lilly Research Laboratories, was honored by the American Diabetes Association at its annual meeting, June 7-8, at Atlantic City, New Jersey. Dr. Clowes delivered the annual Banting Memorial Address and was awarded the Banting Medal, given in recognition of distinguished service in the field of diabetes.

Eastman Kodak Company has offered to 16 educational institutions 22 fellowships in chemistry, physics, engineering, and business administration for the 1947-48 school year. The fellowships, established in 1939 to enable outstanding young scientists to do advanced work in scientific and engineering fields, have been offered each year except 1944-45. Of the

12 fellowships for doctoral work (\$1,200 each), one in physics and one in chemical engineering will go to Massachusetts Institute of Technology; one each in physical chemistry to Columbia, Rochester, and Yale Universities; to Harvard, Illinois, Nebraska, and Notre Dame Universities, in organic chemistry; to California Institute of Technology and the Universities of Michigan and Wisconsin, in physics. Ten fellowships for master's work, each of \$750, have been offered to Columbia, Michigan, Illinois, and Northwestern Universities (business administration); Carnegie Institute of Technology and Iowa State (mechanical engineering); Cornell University and Rensselaer Polytechnic Institute (electrical engineering); Cornell University and University of Michigan (chemical engineering). Six Tennessee Eastman awards include four at \$1,200 for doctoral work in chemistry at Brown University and the Universities of Tennessee, North Carolina, and Virginia, and two for master's work (\$750 each) in chemical engineering at Virginia Polytechnic Institute and in textile engineering at Georgia School of Technology. Selection of students is made by the recipient institution.

Meetings

The Purdue Section, American Society of Plant Physiologists, has announced that E. J. Lund, author of the recent *Bioelectric fields and growth*, will give a series of three lectures and additional round-table discussions on "Bioelectric Phenomena and Cell Correlations" at its summer meetings, which will begin with registration on the morning of July 24 and conclude with a botanical field trip through Turkey Run State Park, Friday afternoon, July 25. All those interested are invited to attend. Reservations and additional information may be secured from H. H. Kramer, Agronomy Department, Purdue University, Lafayette, Indiana.

The Australian and New Zealand Association for the Advancement of Science will hold its 26th meeting in Perth, August 20-27.

The 8th International Congress of Entomology will be held in Stockholm, Sweden, August 8-15, 1948. It is necessary that those planning to attend arrange for steamship passage early this fall,

since sailings are currently booked to capacity for months in advance. It is understood that the 13th International Congress of Zoology will be held in Paris in July 1948, and it is hoped that all entomologists going to Stockholm will plan to attend the Zoological Congress in order that the interests of the entomologists may be fully represented before the more comprehensive body. Those expecting to attend the Stockholm Congress should contact Prof. O. A. Johannsen, Comstock Hall, Cornell University, Ithaca, New York, as early as possible.

The American Association of Petroleum Geologists will hold its 33rd annual meeting in Denver, Colorado, April 26-29, 1948. The Rocky Mountain Association of Geologists will be the host for this occasion, and it is planned that the annual meetings of the Society of Economic Paleontologists and Mineralogists and the Society of Exploration Geophysicists will be held in Denver at the same time. T. S. Harrison and A. E. Brainerd, both consulting geologists of Denver, are in charge of arrangements.

Elections

At the Annual Election Meeting of the Czechoslovak Academy of Agriculture, May 7, 1947, several Czechoslovak and foreign agricultural scientists were elected to honorary membership. This is considered the highest distinction for services or scientific work in agriculture. The maximum number of living honorary members is limited to 40. Those elected include: H. C. Josef Opletal, professor, Agricultural College, Brno, Czechoslovakia; Edwin R. Henson, director, Agricultural Rehabilitation Division, UNRRA, Washington, D. C.; Nikolaj Vasilijevic Cicin, director, Plant Breeding Institute, Moscow; Trofim Denisov Lysenko, director, Lenin Academy of Agriculture, Moscow; Sir John Boyd Orr, director general, FAO, Warden Hill, Scotland; and Herbert C. Hanson, chief, Agricultural Division, UNRRA Mission, Prague, Czechoslovakia.

Elected as corresponding members, the limit of which is 120 foreign workers, were: C. G. Vilenskij, professor of pedology, University of Moscow; Hans Pallman, professor of agrochemistry, Technical University, Zürich, Switzerland; Kyril Pavlov, chief, Selection Department, State Research Institute, Sofia, Bulgaria; Nikolaj Belcen Kolev, direc-

tor, Plant Selection Institute, Sofia, Bulgaria; John Hammond, professor, animal physiology, Cambridge University, Cambridge, England; and Dimitr Bailov, professor and director, Tobacco Growing Institute, Agricultural-Forestry Faculty, Plovdiv, Bulgaria.

K. Kavina, professor of botany, University of Prague, is president of the Academy, and F. Duchon, secretary. The Academy issues the following journals: *Vestnik CAZ* (Journal of the Czechoslovak Academy of Agriculture) with *Ceska Zemedelska Bibliografie* (Bibliography of Czech Agriculture); and *Sbornik CAZ* (Almanac of the Czechoslovak Academy of Agriculture).

The University of Oregon Chapter of Sigma Xi has recently elected the following officers for the coming year: Lloyd W. Staples, Department of Geology, president; John M. Pierson, University of Oregon Medical School, vice-president; E. Ebbighausen, Department of Physics, secretary; and K. S. Ghent, Department of Mathematics, treasurer.

The Minnesota Academy of Science, at its 15th annual meeting held at State Teachers College, Mankato, April 26, elected Walter J. Breckenridge, director, Museum of Natural History, University of Minnesota, president; Duncan Stewart, Carleton College, Northfield, vice-president; W. C. Croxton, State Teachers College, Saint Cloud, councilor, 1947-51; and John W. Moore, University of Minnesota, secretary-treasurer, for a four-year term. George J. Miller, State Teachers College, Mankato, retiring president, became a two-year member of the Council, and Robert C. Molkenbur, Central High School, St. Paul, newly elected president of the Minnesota Junior Academy of Science, is a member, ex officio, of the Senior Council for the year.

NRC News

A Committee on UNESCO has been formed to facilitate the participation of scientists in the program of the United Nations Educational, Scientific, and Cultural Organization. The present membership includes Detlev W. Bronk, chairman, National Research Council; R. E. Cleland, University of Indiana; William Higinbotham, Federation of American Scientists; J. S. Nicholas, Yale University; Merle A. Tuve, Carnegie Institution of Washington; Maurice B.

Visscher, University of Minnesota; Gene Weltfish, Columbia University; Dael Wolfe, American Psychological Association; and Raymund L. Zwemer, National Academy of Sciences and National Research Council. Bart J. Bok, Harvard University, is chairman of the Committee.

The Committee proposes to act as a clearinghouse for suggestions about UNESCO activities submitted by American scientists; to urge full participation by American scientists in the affairs of UNESCO and to give wide publicity to the activities of UNESCO, especially in the field of the Natural Sciences; to promote exchanges of scientists under the auspices of UNESCO; and, when requested, to assist the Natural Sciences Division in Paris, the Field Science Cooperation Offices, and members of the U.S. National Commission of UNESCO.

Recent Deaths

Ralph A. Jacobson, 51, research chemist, Chemical Department, E. I. du Pont de Nemours and Company, died July 2 after a short illness.

William Carl Ruediger, 73, dean emeritus, School of Education, George Washington University, and former provost, died at his home in Washington, D.C., on July 4.

Warren B. Davis, 65, clinical professor of plastic and reconstructive surgery, Jefferson Medical College, and surgeon, Jefferson Hospital, died July 7 at his home in Overbrook, Pennsylvania, after a long illness.

Mark Helman, 71, dermatologist and syphilologist, St. Joseph's Hospital, Syracuse, New York, and former president, American Academy of Dermatology, died July 2 at his home in Syracuse.

S. F. Light, 61, professor of zoology at the University of California since 1929, died in Berkeley, California, June 21. Dr. Light is co-author of two articles on termites, to appear in *Science* in the near future.

An Indian Phytopathological Society was established by mycologists and plant pathologists meeting at the Indian Agricultural Research Institute, New Delhi, February 28, 1947. Membership is open to all individuals and groups

interested in the study of fungi, bacteria, viruses, and their useful and harmful aspects. Those joining before January 10, 1948 will be designated as Charter Members. Communications should be addressed to: B. B. Mundkur, Secretary-Treasurer, Indian Phytopathological Society, Agricultural Research Institute P. O., New Delhi, India.

A two- to three-month stay in Sweden is in store for about 120 scientists and teachers from European war-devastated countries, according to a recent report from the American-Swedish News Exchange, Inc. Costs of their stay are to be paid by the Swedish Government. Although most of the visitors will arrive in September, at the beginning of the university term, opportunity is afforded those who wish to attend scientific congresses to be held in Sweden this summer to do so. Although many different branches of science are represented, the majority are medical men and technologists.

The South African Council for Scientific and Industrial Research, set up in October 1945 as "a corporate body responsible to the Prime Minister for the formulation and the implementing of a national policy of scientific and industrial research," has organized Liaison Offices in both England and the United States. Inquiries from the respective countries relating to work being done in South Africa should be addressed to: Head: South African Scientific Liaison Office, 39 Princes Gate, Exhibition Road, London S. W. 7, or 1785 Massachusetts Avenue, Washington 6, D. C.

Make Plans for—

Conference on Algebra, July 25-28, University of Michigan, Ann Arbor.

New England Association of Chemistry Teachers, 9th Summer Conference, August 18-23, Wellesley College, Wellesley, Massachusetts.

Annual Symposium, Society for the Study of Development and Growth, August 26-29, University of Connecticut, Storrs.

American Association for the Advancement of Science, 114th Meeting, December 26-31, Chicago, Illinois.

COMMENTS

by Readers

In a recently published article by Rake, Alexander, and Hamre (*Science*, October 26, 1945), the following statement was made: "It would seem most probable that the agent of heart-water fever, while not distinctly either a *Rickettsia* or a member of the lymphogranuloma-psittacosis group, is related to both."

In a tentative classification of the cytotropic viruses of the *Chlamydozoa-Rickettsiae* group (*Adv. mod. Biol.*, 1945, 19, 1-44), I have indicated that the causative agent of heart-water fever differs from the classical *Rickettsiae* and agrees with the organisms of the family *Ehrlichiae* in its dimensions, in sensibility toward the action of the sulfonamide drugs, and especially in its aptitude to provoke the formation of vacuoles in the host cell, including the aggregated elementary bodies representing the parasite.

The subgeneric name *Cowdria* (in honor of Edmund V. Cowdry) was therefore proposed for this organism, and the necessity of separating it from the genus *Rickettsia* was taken into consideration.

I can thus fully agree with the authors of the above-mentioned article on the close parentage between the causative organism of heart-water fever and the members of the lymphogranuloma-psittacosis group belonging, according to the named classification, to the subgenus *Ehrlichia* (*Myiagawanella*).

The striking resemblance between the agent of heart-water fever and *Ehrlichia kurlovi* as to the dimensions of the single elementary bodies, the production of vesicles in the affected cell, and the tendency to assume a bacilliform appearance is clearly visible in the illustrations of my article (*Adv. mod. Biol.*). During Dr. R. Weigl's visit to Moscow, I was able to show him preparations of *E. kurlovi* which were indistinguishable from *R. ruminantium*.

On the other hand, the agent of heart-water differs from the members of the genus *Ehrlichia*, including the subgenus *Ehrlichia* (*Myiagawanella*), in its histo-

tropism and the mode of propagation. Its antigenic differences have also been recently established (*Science*, October 26, 1945).

On these grounds we propose to raise the subgenus *Cowdria* to the rank of a genus, intermediate between the families *Rickettsiaceae* and *Ehrlichiae*, having in common with the first the tropism to the cells of vascular endothelium and sharing with the second the localization inside vacuoles formed in the cytoplasm of the host cell. The specific name of the agent of heart-water fever will then be *Cowdria ruminantium* nom. nov., and the diagnosis of the genus *Cowdria*: cytotropic organism, coccoid with a tendency toward formation of bacillar forms; characteristic localization in the form of clusters inside vacuoles in the cytoplasm of vascular endothelium. (SH. D. MOSHKOVSKI, *Institute of Malaria and Medical Parasitology, Moscow, USSR.*)

Any fungus that causes decay of heartwood is a pathogen. This thesis is an incident of my interest in the problem of competition between sprouts and seedlings in the forest. It is my view on decay as one of the factors in the decadence of coppice. The entire causal basis of the superiority of seedlings over sprouts is probably within the realm of developmental anatomy (private publication of author, February 1947, on "The nature of the seedling and sprout growth forms").

A large volume of literature on the subject of developmental anatomy has appeared in recent years. Bailey, Chalk, Cockerham, Elliot, Priestley, and others have probed into the subject. Their work on the stele and their studies on the influences of environmental factors on developmental anatomy have enriched the field of botany and given us useful tools of knowledge. My own studies on the effects of temperature and rainfall indicate that the speed and the degree of differentiation of tissues can be influenced by external factors ("Studies on breakage of apple trees," unpublished, Pennsylvania State College, 1936).

The entire subject of meristems, development, and behavior is in a state of flux. The complex pattern of interwoven threads of the origin, organization, form, mass, and location of a meristem, in relation to the appearance of axes, leaves, and blossoms, the form and size of organs, and the organization and extent of primary and secondary tissues, is slowly becoming apparent. It is obvious, however, that the locations, kinds, and human uses of initials are still problems and not findings. Discoveries are largely in the realm of the future (*Science*, October 4, 1946, p. 329; *Bull. Torrey bot. Club*, 1936, 63, 259-265).

With regard to the thesis posed above, heartrot is more likely an indirect rather than a direct cause of failure in coppice. Though a tree may be broken by the wind, or may fall of its own weight after heartrot has spread in the bole, a tree so weakened has lost its competitive power before the mechanical defects are obvious. From the time it appears in the wood, heartrot will interfere in a cumulative manner with normal development, through retardation of the developmental processes, with consequent reductions and changes in the amounts and types of tissues that form. By reducing the capacity of heartwood to act as a water reservoir, especially during the latter part of the growing season, the progressive spread of decay will interfere with the production of, and differentiation in, tissues and therefore with the movement of water and the translocation of solutes. Such interference with movement, through retardation of transportation capacity, will influence adversely the developmental anatomy of the plant. Given such a situation, any fungus that causes heartrot is a pathogen. (ISADOR AARON, *P. J. Osterling & Son, Inc., Butler, Pennsylvania.*)

The word *nuclide*, derived from *nucle* (nuclear) and *eidōs* (species), is defined as "a species of atom characterized by the constitution of its nucleus." It is proposed that this term be used for the concept in question in place of such incorrect or inconvenient expressions as *isotope*, *nucleus*, *atomic species*, and *nuclear species*. A more detailed discussion is being published in the *American Journal of Physics*, July-August 1947, 15. (TRUMAN P. KOHMAN, *Institute for Nuclear Studies, University of Chicago.*)

TECHNICAL PAPERS

Influence of Dithiopropanol (BAL) on Human Lead Metabolism

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and ROBERT A. KEHOE

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Barron and Kalnitsky (2) have shown that certain heavy metals, including lead, may produce complete inhibition of the sulfhydryl-containing enzyme, succinoxidase, and that the enzyme is reactivated on the addition of certain dithiopropanol (BAL) derivatives. This is the type of evidence that has been accumulating in support of the hypothesis that heavy metals are toxic to biological systems because of their reversible combination with the sulfhydryl groups of the protein fraction of cellular enzymes (4). The value of dithiopropanol in the treatment of rabbits poisoned by single and multiple intraperitoneal inoculations of lead nitrate has been examined by Braun, Lusky, and Calvery (3). Their experimental findings were regarded by themselves as evidence that lead and dithiopropanol exert additive toxic effects in both acute and chronic types of poisoning due to lead.

We have studied the effect of one intramuscular dose of dithiopropanol (5 mg./kg. of body weight) upon the concentrations of lead in the blood and urine of each of a series of men whose occupations, at the time of the observations and for some time previously, involved no exposure to lead or varying degrees of severity of exposure. Some of these men were suffering from lead poisoning, and others were not. The observations were carried out, repeatedly, upon a number of the men. Samples of blood and urine were analyzed for lead by a dithi-zone method (1) of known sensitivity and precision.

The concentration of lead in the whole blood decreases promptly and considerably following the administration of this agent (Table 1). The initial rate of decrease is extremely rapid, a sizable change being demonstrable within 7½ minutes, and, judging from the apparent hyperbolic relationship of the early values, being well under way even earlier. The fall appears to reach its maximum within 8 hours; it is relatively greater, but absolutely less, the lower the initial concentration of lead in the blood. The concentration in the blood returns to approximately the previous level within 24-48 hours. This entire series of effects can be obtained again and again by repetitive administration of the agent.

The concentration of lead in the urine has been found to be moderately or greatly enhanced by the administration of dithiopropanol (Table 1). The urinary concentration of lead reaches its peak within an hour or two following the injection and diminishes rapidly to the previous level in from 8 to 24 hours. In those cases in which the increase in the concentration of lead in the urine was of only moderate proportions, the analysis of blood samples, drawn at the end of the functional

periods represented by the samples of urine, demonstrated that the usual response to the administration of dithiopropanol had occurred therein, and the usual symptomatic effects, if any, of the agent were observed.

The concentration of lead in the blood plasma of these men was found to be independent of the cellular concentration of lead and was also unrelated to signs or symptoms of lead intoxication. It appeared to be unaffected by the administra-

TABLE 1
CONCENTRATION OF LEAD (µg./100 GRAMS) FOLLOWING
INTRAMUSCULAR ADMINISTRATION OF DITHIOPROPANOL
(BAL)

Subject	Date	Before BAL			Seven minutes after BAL			One hour after BAL		
		Cells	Plasma	Urine	Cells	Plasma	Urine	Cells	Plasma	Urine
C. F.	12-31*			2						160
	2-3	70	9	3	40	6		28†	7†	9†
W. E.	12-25*			2						35
	2-10	65	9	1				40	12	48
E. G.	12-10‡	200	9	16				130	9	250
	12-27	145	5	9						580
N. B.	1-30‡	340	5	75	290	8				1,760‡
	2-10	240	6	24	200	10				520‡
A. E.	1-31‡			17						620
	2-11	315	8	11	230	14				430
O. C.	1-31‡			18						51
	2-17			36						1,310‡
J. H.	3-25	1,250	6	11	1,250	6				23
	3-28	1,100	3	14	1,200	3		1,050	3	113‡

* Case of poisoning with bichloride of mercury.

† Samples taken ½ hour after administration of BAL.

‡ Subject suffering from lead colic on this date, but not on that of later observation.

§ Samples taken 2 hours after administration of BAL.

|| Subject not suffering from lead colic on either occasion. He was given 1.8 mg. of dithiopropanol/kg. of body weight on each occasion; the other men were given 5.0 mg./kg.

tion of the agent (Table 1). The samples of plasma, which averaged 25 grams in weight, were obtained by the prompt centrifugation of whole blood drawn into a dry syringe and heparinized. The observations on the concentration of lead in the plasma cover the extremes in the range of cellular concentration of lead. These results indicate that relatively large quantities of lead released from the erythrocytes do not remain within the blood stream, but are lost with great rapidity, to appear, presumably, in the tissues generally as well

as in the urine. They also suggest that a great proportion of the lead remaining in the plasma is bound to some constituent or radical that is fully saturated thereby, even when the lead concentration in the whole blood does not exceed the normal limits. These facts and considerations may well explain our inability at any time to confirm the reports of Smith, Rathmell, and Marcil (5), to the effect that the lead concentration in the plasma is elevated in human lead intoxication.

The interest that attaches to any agent that can produce such remarkable metabolic effects as those described above is naturally great. By carefully designed metabolic experiments, we have been unable to discover evidence of the ability of any other therapeutic agent or combination of agents to influence materially the pattern of lead metabolism in the human organism. The administration of acids, alkaline salts, and iodides, as well as experimentally induced changes in the calcium and phosphorus metabolism, has failed utterly in our hands to bring about more than the most dubious and insignificant alterations in the lead content of the blood or in the rate of excretion of lead on the part of normal individuals or of persons with considerably increased quantities of lead in their tissues and excreta. Indeed, we have found no effect which could not be brought about more strikingly and more persistently by altering the rate of water intake of the patient or subject under study.

Thus, the effects of the administration of dithiopropanol are unique in our experience and are of potentially great physiological importance. However, their significance at this time should not lightly be credited to the field of therapy, since the intensity and brevity of the single response is such that no quantitatively important proportion of the absorbed lead of a poisoned or endangered individual has been removed thereby from the body.

We also wish to emphasize that dithiopropanol is potentially a dangerous drug, and that lead intoxication is largely a self-limited disease for which the only primary treatment of proved value is the removal of affected men from further exposure to lead. We have been unable consistently to shorten the clinical course of lead intoxication, to maintain a significantly increased rate of elimination of lead, or to decrease the duration of the occupational disability of affected men, by repeated doses of the drug, because of the induction of hypertension, annoying local or generalized immediate reactions, or delayed generalized muscular aching. In addition, our observations suggest that the drug may have relatively less effect, the greater the concentration of lead in the body fluids. This phenomenon is analogous to the observations of Barron and Kalnitsky on the disproportionate reduction of the effectiveness of dithiols following increases in concentration of the heavy metal inhibiting preparations of succinoxidase.

References

1. BAMBACH, KARL. *Ind. eng. Chem. (Anal. ed.)*, 1939, 11, 400.
2. BARRON, E. S. G., and KALNITSKY, S. Quoted by L. L. Waters and C. Stock. *Science*, 1945, 102, 603.
3. BRAUN, H. A., LUSKY, L. M., and CALVERY, H. O. *J. Pharm. exp. Therap. (Suppl.)*, August 1946, 123-124.
4. GILMAN, A., PHILLIPS, F. S., ALLEN, R. P., and KOELLE, E. S. *J. Pharm. exp. Therap. (Suppl.)*, August 1946, 85.
5. SMITH, F. L., 2ND., RATHMELL, T. K., and MARCIL, G. E. *Amer. J. clin. Path.*, 1938, 8, 471.

The Ultraviolet Absorption Spectrum of Cerebrospinal Fluid: Ascorbic Versus Nucleic Acid

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A recent report (8) on the origin of an enzyme in cerebrospinal fluid (CSF) which produces a chromatolytic effect following cerebral concussion has been predicated upon spectrophotometric data based upon two assumptions which, according to our experiments, are not valid. These two assumptions are: (1) "Normal" CSF (of humans and dogs) has a relatively weak and characterless, so-called "S-shaped" ultraviolet absorption spectrum; and (2) "abnormal" CSF's differ from "normals" by showing a strong and characteristic absorption spectrum with band peak at 265 m μ , which Spiegel, *et al.* (10, 11) and others (1) have attributed to nucleic acids.

We have been carrying on a systematic study of the ultraviolet absorption of the CSF since February 1946 and have analyzed² to date the CSF's of 80 humans, 5 dogs, and 12 cats. Contrary to the widely accepted assumptions stated above, we have found that the same strong 265-m μ band dominated the spectrum of the "normal" as well as of the "abnormal" CSF and was in either case due to ascorbic acid and not nucleic acid. In fact, no significant amount of nucleic acid has been found by us in either the "normal" CSF's of dogs, cats, or humans or in the "abnormal" CSF's of a large number of epileptic patients, a cocaine-convulsed dog, or 6 cats after cerebral concussion. The failure of Spiegel, *et al.*³ and others (5, 6, 9) to observe the strong 265-m μ band in "normal" CSF has probably been responsible for the misinterpretation of the same band in the "abnormal" CSF. The weak "normal S-shaped" curve for CSF was described as early as 1927 (5) and unfortunately has been "confirmed" since by various investigators, with one exception (7). Strong sources of ultraviolet irradiation used in the measurement technique in earlier methods or other factors which destroy the easily oxidizable ascorbic acid readily explain the failure to observe its presence.

Our evidence for positively identifying the 265-m μ band in CSF with ascorbic acid has been derived from an extensive investigation (approximately 1,000 spectrophotometric curves have been analyzed) of the effects of a number of independent variables which affect its structure, and consequently the absorption spectrum, in characteristic fashion.

The unique qualitative and quantitative alterations of the spectrum of ascorbic acid when the pH is shifted and when different solvents are used (14) afford effective criteria for its identification. The effect of pH on ascorbic acid is pronounced, due to the marked difference in the spectrum of the ion and the undissociated molecule. When the pH of ascorbic acid in

¹ "Abnormal" fluids are defined as fluids associated with abnormal neurological conditions, namely, (1) convulsive states induced in dogs by electrical shock; (2) human cases with nervous disorders such as epileptic or other convulsive states (9, 11).

² A Model D. U. Beckman quartz spectrophotometer and cells with a path length of 1 cm. were used.

³ The presence of a strong band at 265 m μ was observed (11) in two out of three "normal" cases but was discounted.

Locke's solution is altered from pH 7 to pH 2, a relatively large shift of the maximum (200 Å) to shorter wave lengths occurs. Our data indicate that this is accompanied by a lowering of the extinction coefficient in the ratio of 1:1.6. A similar shift in spectrum is observed in comparing dilute solutions of ascorbic acid in water and in strong alcohol. The 265-m μ band in CSF shows not only the same wave length shift (Fig. 1) but also the correct extinction coefficient ratio. On the contrary, the spectrum of thymus nucleic acid shifts only slightly with a corresponding pH change and in the opposite direction to ascorbic acid, and is unaffected by alcohol.

Another test for ascorbic acid deals with its instability. The ready aerobic decomposition of ascorbic acid by catalytic oxidation may be produced in many ways: by irradiation with

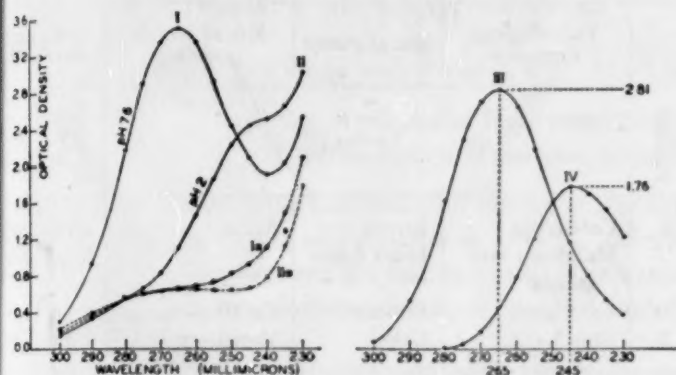


FIG. 1. I: A typical absorption spectrum of a "normal" CSF. II: Same CSF altered to pH 2. Ia: Same CSF returned to pH 7 after ascorbic acid destruction at pH 11. IIa: Same as Ia at pH 2. III: Difference curve obtained by subtracting Ia from I. IV: Difference curve obtained by subtracting IIa from II. Curves III and IV are identical with the absorption spectra of ascorbic acid at pH 7 and pH 2 as described by the positions of the maxima and the ratio of their extinction values (see text). The ascorbic acid concentration evaluated from each curve is the same (3.1 mg. per cent).

ultraviolet light, by increase in pH above 10 at room temperature, by addition of catalysts such as Cu ion, and by heat (decomposition occurs even at room temperature). The 265-m μ band in CSF responded to all of these decomposition tests. On the contrary, although thymus nucleic acid is decomposed by strong ultraviolet irradiation (4), we find that it is unaffected by any of the other tests.

The observation by Spiegel, *et al.* of the disappearance of the 265-m μ band from a fresh sample of CSF is precisely what one might expect of ascorbic acid and therefore cannot be accepted as evidence for a chromatolytic enzyme which splits nucleic acids (8, 12).

The unique properties of ascorbic acid not only aid in its identification but also make it possible to evaluate it quantitatively in CSF. Thus, an ascorbic acid analysis may be made by measuring the spectrum of a fresh sample of CSF before and after destroying the ascorbic acid by raising the pH above 11. By measuring the difference of extinction before and after destruction at both pH 7 and pH 2, two independent evaluations of the ascorbic acid concentration are obtained. A "normal" curve and the method of analysis are presented in Fig. 1.

It may be seen that the residual absorption (curve Ia) after the destruction of ascorbic acid gives the so-called "S-shaped normal" curve. Because purines and nucleic acids are not destroyed by the pH changes, they, if present, would appear in the residual curves. The residual curve of Fig. 1 is typical of

both the "normal" and a large number of epileptic cases as well as of the "normal" and "abnormal" dogs and cats. The residual curve is due primarily to protein and to free amino acids. Purine, if present at all, can be in only trace amounts, because we have demonstrated that ultraviolet irradiation produces a rise in extinction, as it does for albumin (3), rather than a fall, as would occur if purines were present in significant concentrations. There is a minor distortion to wave lengths shorter than the maximum of serum protein which suggests the presence of insignificant amounts of other substances which may be purines. We have found occasional abnormalities in the amount and quality of the residual spectrum. These have been due to pathologically correlated increases of protein content, occasional increased "end" absorption which is hard to identify, and a few cases with additional characteristic absorption which have been identified as uric acid.

Incidentally, the concentration of uric acid in "normal" CSF has been negligible (certainly less than 0.5 mg. per cent), which is of significance to the ultrafiltrate theory of formation of cerebrospinal fluid.

Our values of ascorbic acid in CSF of the group of 80 mixed "normal" and "abnormal" patients (mostly the latter) range from 0.3 to 4.8 mg. per cent. This average value of ascorbic acid in CSF is twice the reported normal value for human blood plasma (15). Wortis, *et al.* (13), using the conventional chemical methods, have reported similarly high values of the ascorbic acid content of CSF compared with blood plasma. The average value and upper limit of the range is approximately three times greater than has been reported by other investigators, all European (2). The contrary findings may be due to dietary differences and to the difficulties of carrying out the chemical method of assay. The spectrophotometric measurements are direct and free from manipulation losses. We cannot state at this time whether or not a correlation in ascorbic acid content exists between "normal" and "abnormal" CSF's. The average ascorbic acid concentration of the 5 dogs was 2.5 times higher than that in humans and cats. These variations may reflect dietary differences.

References

1. AMANO, S., *et al.* *Trans. Soc. Path. Jap.*, 1936, 26, 350-358.
2. BEZSSONOFF, N., and STORER, E. *Z. Vitaminforsch.*, 1936, 5, 193; MARINESCO, A., *et al.* *Bull. sci. Acad. Roumaine*, 1936, 22; BEZSSONOFF, N., *et al.* *C. R. Soc. Biol.*, 1939, 132, 540-544; BEZSSONOFF, N., *et al.* *Arch. phys. Biol.*, 1944, 17, Suppl. 58-60.
3. HAUSMANN, W., and SPIEGEL-ADOLF, M. *Klin. Wschr.*, 1927, 6, 2182-2184.
4. HEYROTH, F. F., and LOOFBOUROW, J. R. *J. Amer. chem. Soc.*, 1931, 53, 3446.
5. JACOBI, W. *Psychiat. Nervenkr.*, 1927, 29, 317.
6. KARCZOG, H., and HANAK, M. *Biochem. Z.*, 1932, 245, 106.
7. NODA, H., *et al.* *Trans. Soc. Path. Jap.*, 1937, 27, 57-66.
8. SPIEGEL, E. A., SPIEGEL-ADOLF, M., and WYCIS, H. T. *Science*, 1947, 105, 208.
9. SPIEGEL-ADOLF, M., HENRY, G. C., WYCIS, H. T., and SPIEGEL, E. *Trans. Soc. Path. Jap.*, 1945, 4, 104.
10. SPIEGEL-ADOLF, M., and SPIEGEL, E. A. *Fed. Proc.*, 1944, 63, No. 1.
11. SPIEGEL-ADOLF, M., and WYCIS, H. *J. phys. Chem.*, 1946, 50, 448-452.
12. SPIEGEL-ADOLF, M., WYCIS, H. T., and SPIEGEL, E. *Fed. Proc.*, 1946, 5, 156.
13. WORTIS, H., LIEBMAN, J., and WORTIS, E. *J. Amer. med. Ass.*, 1938, 110, 1896-1899.
14. ———. *Vitamins and hormones*. (Vol. 1.) New York: Academic Press, 1943. P. 130.
15. ———. *The Vitamins*. Chicago: American Medical Association, 1939. Pp. 333, 386, 414.

Comparison of the β -Glucuronidase Activity of Normal, Tumor, and Lymph Node Tissues of Surgical Patients¹

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The physiological role of β -glucuronidase is believed to be that of "metabolic conjugation" (2), especially of the estrogenic hormones. In many animal experiments (2, 4) β -glucuronidase has been shown to be elevated specifically in response to estrogen injection. The excretion of large amounts of steroid glu-

At this time, confirmatory data are presented as well as some new observations on the β -glucuronidase content of human tissues (Table 1). The presence of relatively large amounts of β -glucuronidase in the involved lymph nodes of cancerous patients is reported for the first time (Table 2).

The main observations were as follows: Whereas minimal differences from normal were seen in benign fibroadenoma and gynecomastia of the breast, striking elevations were observed in carcinoma, fibrosarcoma, and in the proliferated lactating breast. In the uterus, the normal endometrium was high in glucuronidase. Carcinoma of the uterus contained more enzyme than did uninvolved uterine tissue. Uterine fibroid was relatively low in activity. In carcinoma of the gastrointestinal

TABLE 1

Patient†	Pathological diagnosis		Glucuronidase units*	
	Lesion	Organ	Tissue	
			Tumor	Normal
K	Benign fibroadenoma	Breast	393	325
C	Gynecomastia	"	267	—
W	"	"	96	—
L	Post-partum death	"	—	1,050
C	Carcinoma	"	890	140
R	" , scirrhus and medullary	"	1,930	62
M	Carcinoma	"	945	—
M	"	"	900	94
D	Fibrosarcoma	"	1,230	145
N	Fibroid	Uterus	405	—
L	Myometrium at parturition	"	—	844
V	Atrophy	"	—	365
H	Recurrent carcinoma	"	884	199
N	Normal endometrium	"	—	2,020
N	Adenocarcinoma	Colon	1,320	1,480
G	"	"	2,770	1,628
O	"	"	1,360	1,760
V	"	Rectum	900	1,930
M	"	Colon	5,250	2,490
N	Lipoma	"	126	1,311
L	Adenocarcinoma	Stomach	3,180	940
K	"	Cardia	1,510	750
B	"	"	2,180	650
B	Benign islet cell adenoma	Pancreas	960	600
E	Carcinoma, scirrhus	"	172	326
L	Post-partum death	"	—	1,045
N	Adenocarcinoma, metastatic	Liver	1,650	2,980
J	" , recurrent (ovary) mucinous	Abdominal wall	1,410	—
C	Carcinoma of ovary, recurrent	"	2,740	554 (mesentery)

* One unit is defined as 1 μ g. of phenolphthalein liberated from phenolphthalein mono- β -glucuronide per hour at 38° from 1 gram of moist tissue under standard conditions (3).

† Patients previously studied (1) have been included for purposes of comparison.

curonides in pregnancy, an observation many times confirmed by others, was accompanied by elevations in blood glucuronidase activity (1). It was also reported (1) that malignant neoplasms of the breast and gastrointestinal tract contained more β -glucuronidase activity than did the corresponding uninvolved tissue.

¹ Aided by a grant from the Otho S. A. Sprague Memorial Institute. The technical assistance of Evelyn Gordon and Belle Springer is gratefully acknowledged.

TABLE 2

Patient	Pathological diagnosis	Site of tumor	Site of lymph node	Glucuronidase units	
	Lesion			Involved node	Uninvolved node
C	Carcinoma	Breast	Axilla	2,740	694
T	Malignant melanoma	Index finger	"	2,532	680
W	Carcinoma	Prostate	Cervical region	6,700	—
B	"	Colon	Mesentery	1,590	206

tract, elevations in glucuronidase occurred in the cardioesophagus, stomach, and less frequently in the colon. In tumors of the pancreas no change or a decrease in activity was observed. Adenocarcinoma, recurrent and metastatic to the abdomen, contained relatively large amounts of enzyme. Lymph nodes which have been removed from patients with cancer of the breast, colon, and prostate and with malignant melanoma contained excessive amounts of β -glucuronidase as compared with the corresponding uninvolved tissue.

The observation of the enhanced β -glucuronidase activity of lymph nodes involved by cancer seems particularly important. Here, the lymph nodes may be considered to be tissue cultures of cancer cells, and this is where the highest glucuronidase concentrations have been observed. The same is true for mesenteric recurrences of cancer.

Two important questions arise from these results. Is enhanced glucuronidase activity a characteristic of cancer cells? If so, what is the significance of this finding?

In considering the first question, a clear-cut answer at first would appear difficult in view of the results in carcinoma of the pancreas and in a few cases of adenocarcinoma of the colon. However, if the tumor is small and is surrounded by much fibrous tissue, differences in activity may be impossible to demonstrate. Also, the adenocarcinoma of the colon involves both mucosal and muscle elements, whereas the control tissue has been colon mucosa, which possesses high glucuronidase activity. Nevertheless, 11 of 14 of the primary neoplastic tissues, 4 of 4 metastases to lymph nodes, and 3 of 3 recurrences to abdominal wall and uterus contained increased glucuronidase activity. Accordingly, the view may be taken that elevated β -glucuronidase is probably a characteristic of malignant cells, although a high glucuronidase activity in a tissue does not necessarily imply malignant change.

The question of the significance of the presence of higher activities of β -glucuronidase in tumor tissues cannot be answered at this time. Studies of many other enzymes in tumor tissue have shown, in the majority of cases, a lowered activity as compared to the enzymic activity of normal tissues.

References

1. FISHMAN, W. H. *Science*, 1947, **105**, 646.
2. FISHMAN, W. H. *J. biol. Chem.*, 1947, **159**, 7.
3. FISHMAN, W. H. (To be published.)
4. FISHMAN, W. H., and FISHMAN, L. *J. biol. Chem.*, 1944, **152**, 487.

Blood Plasma Ascorbic Acid Levels on Controlled Intakes of Ascorbic Acid

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A survey of the ascorbic acid status of college students reported from the University of Tennessee in 1944 (1) indicated a limited relationship between the fasting blood plasma ascorbic acid level and the calculated intake of ascorbic acid the preceding day.

An outgrowth of this work was a series of studies, from 1942 to 1947, with subjects maintained on controlled intakes of ascorbic acid. Considerable data were accumulated on blood plasma ascorbic acid values on these intakes. Since the plasma ascorbic acid is often determined in population survey studies, a statement of these values, with their standard deviations, may aid in the interpretation of survey data and indicate the dietary intake of ascorbic acid in these populations.

The subjects were 41 young women in their early 20's who weighed 44-76 kg., with an average weight of 57 kg. The

TABLE 1

BLOOD PLASMA ASCORBIC ACID VALUES WITH STANDARD DEVIATIONS FOR 41 SUBJECTS (MEAN WEIGHT, 57 KG.)

Intake ascorbic acid (mg.)	Plasma ascorbic acid (mg./100 ml.)	Standard deviations (mg./100 ml.)	Range (mg./100 ml.)
32	0.48	± 0.137	0.34-0.62
57	0.72	± 0.210	0.51-0.93
82	0.93	± 0.196	0.74-1.13
107	1.05	± 0.170	0.88-1.22

fasting plasma ascorbic acid values given in Table 1 are 2-day and 6-day averages following 7- to 10-day adjustment periods at each level of intake. Fifty, 75, and 100 mg. were given daily as the synthetic vitamin. The diet contained an average of 7.1 mg. of reduced ascorbic acid. In the first experiments on 17 subjects, intakes were increased by intervals of 25 mg. Later, 24 subjects on the same intakes were studied, but with increasing and decreasing intervals of 25 and 50 mg. The changes in the time and intake schedules as the study progressed were the result of statistical evaluation of existing data and were made to enlarge the scope of the findings.

A 25-mg. ascorbic acid intake for 6 days or 2 weeks preceded the experimental periods. The blood plasma ascorbic acid

values of subjects at this intake decreased or were barely maintained. Adjustment to intake is not claimed for this preliminary period, and the plasma ascorbic acid value given for it is undoubtedly high. A curve through the three experimental values places this plasma level at approximately 0.43 mg. of ascorbic acid/100 ml.

Overlapping of values at the intervals studied becomes more pronounced at the 82- and 107-mg. intakes, perhaps indicating adequacy at the lower level for some subjects. The standard deviation determines the range within which two-thirds of the plasma ascorbic acid values of subjects maintained on the corresponding intake will fall. The wide range in the plasma ascorbic acid values at each of the three levels of controlled intake indicates that any estimation of the vitamin intake of a population based on a plasma ascorbic acid survey cannot be narrowly defined.

Reference

1. DODDS, MARY L., and MACLEOD, FLORENCE L. *J. Nutrition*, 1944, **27**, 315.

Humidity and Tolerance to Low Barometric Pressure

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During experiments in respiration at low pressure it became apparent that high humidities increase the ability of Swiss Albino mice to withstand reduced pressure.

Young male mice ranging in weight from 20 to 30 grams are placed in a small low-pressure chamber, and the pressure is reduced at the rate of 1 cm./minute. The behavior of the animals is closely observed, and the pressure at which respiration stops is noted. Provision is made for controlling the humidity of the air entering the chamber. Tests have been run at 22°, 10°, 0°, -10°, and -20° C. At each combination of temperature and humidity 10 or more animals have been tested.

At all temperatures used, air of 100 per cent humidity increases, in comparison to dry air, the tolerance of the mice to pressure reduction. This effect is most noticeable at -10° C., at which temperature mice in dry air die at an average pressure of 418 mm. Hg (15,500 feet simulated altitude). In air of 100 per cent humidity death occurs at 180 mm. Hg (35,000 feet). At other temperatures the beneficial effect of humidity is somewhat less, but still appreciable. The optimum conditions for survival of these animals are 0° C. and 100 per cent humidity, in which state the pressure is reduced to about 40 mm. Hg before death ensues.

Humidities of 65 and 90 per cent have been employed, but the results indicate that these humidities do not improve the tolerance of mice above that afforded by dry air.

Experiments to determine the effects of humidity on the tolerance of human subjects to reduced pressures, and low temperatures, are in progress. Also, the study on mice is being extended to include the effect of humidity on other respiratory factors.

Electrical Resistance of Whole Blood

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The circumstances accompanying blood coagulation are not yet clearly understood. It is probable that several components and one or more reactive processes are involved prior to the ultimate conversion of soluble fibrinogen to insoluble fibrin. The exact points of attack by the anticoagulants, heparin and dicumarol, are also not clearly defined. That

tinient index for clinical evaluation and drug application will be set up.

Further, the methods employed for the measurement of clotting time are highly subjective; the Lee-White method, which enjoys the widest use, yields reproducible data in skilled hands, but these data are not strictly referable to the data of other laboratories or technicians. It appeared, therefore, that it might be profitable to investigate other properties of the blood which might bear some relation to coagulation or which might change in a manner indicative of the clotting time. These properties must be susceptible to rapid measurement without introduction of extraneous mechanical or chemical factors such as agitation or dilution.

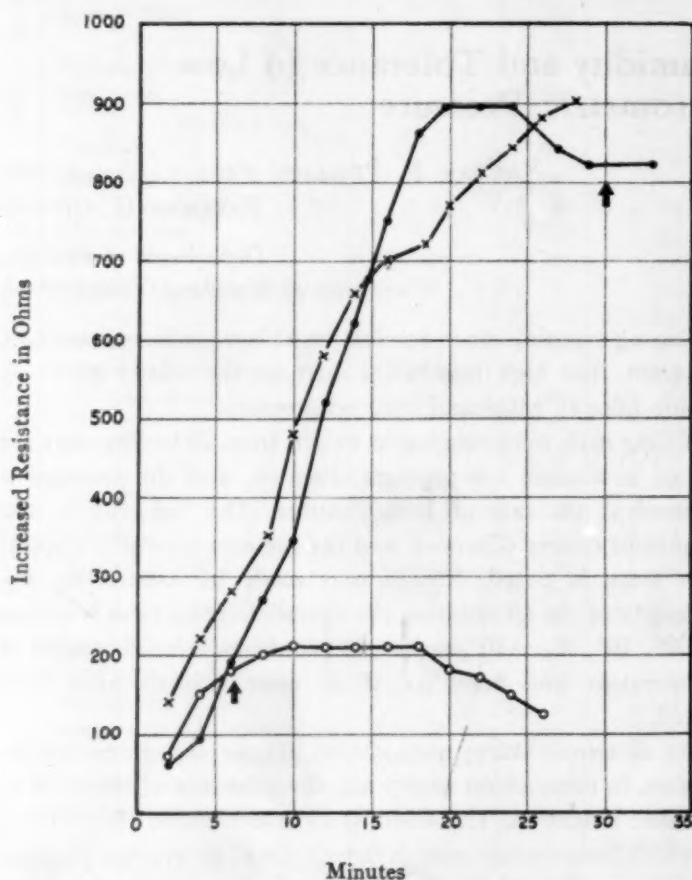


FIG. 1. Representative resistance-time curves: ○—○ Typical normal blood; ●—● Blood from patient receiving heparin over 48-hour period; ×—× Normal blood with excess heparin *in vitro*; ↑ Clot by Lee-White.

the therapeutic use of these agents is not unattended with risk is well known. Clinical administration of the anticoagulants is commonly directed according to the observed clotting time, but this property appears not to be an infallible indicator. It is uncertain whether or not the too-frequently-unpredictable dosage responses arise from errors in the measurement of the clotting time or whether the extravascular clotting time is a relevant guide to therapy. Perhaps when the whole phenomenon of blood coagulation and the action of the anticoagulant drugs are better understood, some more per-

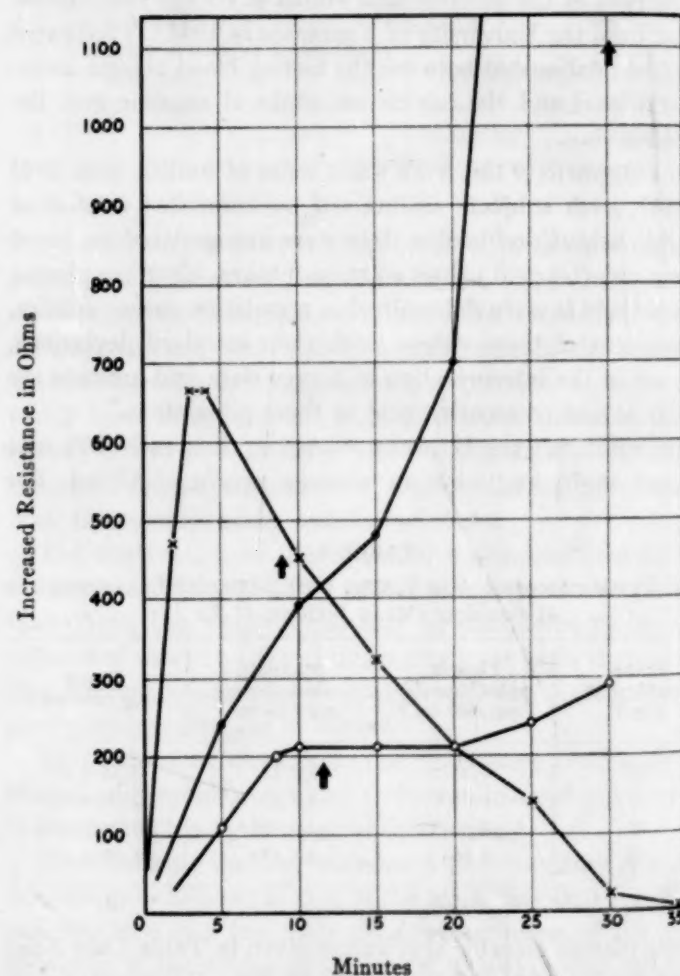


FIG. 2. Alteration in resistance-time pattern by administration of heparin: ×—× Initial blood before heparin; ○—○ Blood from same patient after heparin treatment for 18 hours; ●—● Blood from same patient after heparin treatment for 24 hours, last 8 hours under increased dose; ↑ Clot by Lee-White.

It was anticipated that electrical conductivity might be such a property and, even though it might reveal nothing further, it was expected that the resistance of the freshly drawn blood would increase until coagulation supervened, at which time an inflection in the resistance-time curve would occur. Figs. 1 and 2 demonstrate how well this prediction was realized, but—and this is perhaps of greater significance—these data

also reveal certain wholly unexpected phenomena. In those instances where the coagulation time has been delayed by drugs *in vivo* or *in vitro*, there is an inordinate increase in resistance preceding clot formation when the latter is measured by the Lee-White method. Fig. 2 depicts one example where some intravascular defects were anticipated but wherein the extravascular clotting time was not greatly delayed. The blood specimen taken before medication exhibited a very high initial resistance with an accelerated change in resistance before coagulation. The accompanying curves show the alterations in the blood of this patient after administration of heparin.

These data appear to warrant further intensive investigation of the electrical resistance shifts in freshly drawn blood; such an investigation is under way in our laboratories. For the present we offer the speculation that this increased and increasing resistance is a consequence of the orientation or unfolding of certain plasma proteins in such manner as to form electrically neutral and unionized dipoles. The conductance of the proteins themselves might be thus inhibited, or

in the celi. In order to minimize the possibility of modification of the reactions in the cell arising from the passage of the measuring current, a switch is provided for closing the bridge energizing circuit only when a reading is taken.

A vacuum tube phase-detector and amplifier is used to amplify the bridge output voltage. A zero-center microammeter connected to the amplifier output is calibrated directly in the percentage by which the cell resistance deviates from the value indicated by the four decade dials of the variable arm of the bridge. The scale of the meter is graduated linearly from -15 to $+15$ per cent deviation. Cell resistances within the range of 200 – $10,000$ ohms may be measured. The instrument is compact and portable and may be plugged into the house current supply at the bedside.

The conductivity cell constant was approximately 12 reciprocal cm.; this brought the measured resistance into the most accurate range of the bridge. Since the frequency is low and the electrodes small, it is obvious that the inductance and capacitance factors are minimal; certainly, the change with time of these parameters must be negligible except in so far as they might be affected by the speculative double layer.

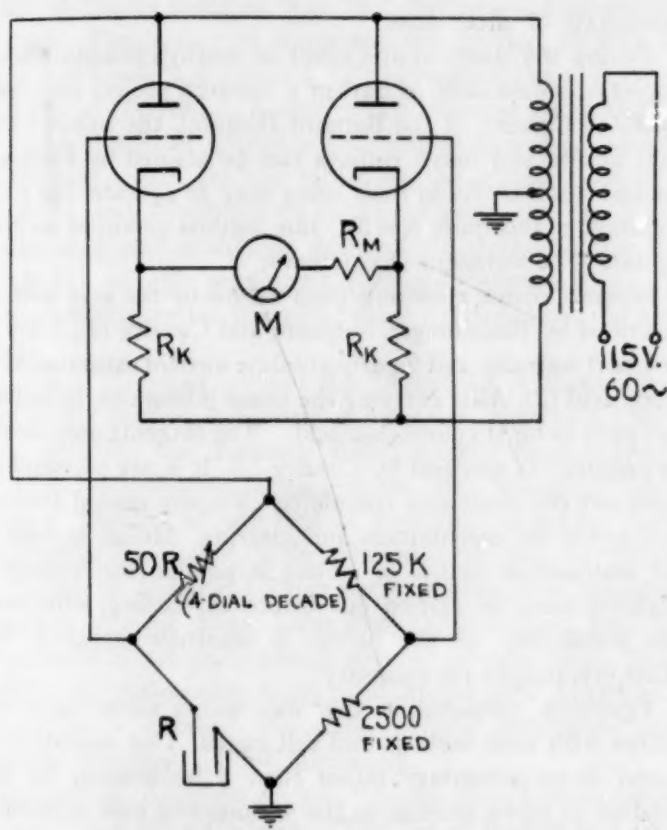


FIG. 3. Alternating-current electrolytic resistance bridge.

the plasma electrolytes might be bound in the hypothetical double layer. The physiological significance of this phenomenon remains to be seen, but it is probable that the latter is affected significantly by the charge of the container—in this instance, pyrex glass. The hypothesis appears to be susceptible to experimental exploration.

The measurements of electrolytic resistance were made with an alternating-current bridge¹ especially designed for this purpose (see Fig. 3). The use of 60-cycle alternating current eliminates polarization in the cell. The voltage across the cell is constant at balance and is equal to about 5 volts r.m.s.; this corresponds to a maximum power dissipation of $\frac{1}{4}$ watt.

¹ Manufactured by Matthew Conrad, Rahm Instruments, Inc., 12 West Broadway, New York City.

Tracer Micrography¹

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In the well-known method of radio autography a radioactive isotope is introduced in a biological or other system, and the distribution of that particular element within the system is determined by bringing the sample in close contact with a photographic emulsion. This method lacks resolving power because, even in the case of perfect contact of the sample with the photographic emulsion, the circle of confusion produced from every point of emission is so great that details less than $.1$ mm. are very hard or impossible to distinguish.

In order to improve the resolution of this tracer method, electron optical image formation was used for the determination of distribution of a radioactive element within a given sample. This is based on the emission of high-speed electrons by many tracer elements and the use of electron optical lens elements for forming an image on a photographic plate or other suitable recording surfaces. In the absence of any method for correction of the chromatic aberration of electron optical lenses, the first attempts were limited to elements which are emitters of monokinetic β -rays (internal conversion electrons). After some attempts with Cb^{93} , Y^{87} , $\text{Sr}^{85,87}$, and Pa^{233} , Ga^{67} was selected for the tests. Gallium chloride was prepared by chemical separation from zinc, bombarded by deuterons in the Department of Terrestrial Magnetism cyclotron, and the solution evaporated drop after drop on a $\frac{1}{4}$ -inch tantalum

¹ The early phase of this work was carried out while one of the authors was attached to Stanford University. During that time work was carried out under a Rockefeller grant and with a considerable amount of collaboration on the part of J. Hamilton and E. Segrè. Their cooperation and the help of the Rockefeller Foundation is gratefully acknowledged.

disk. The latter was used as the emitting surface at a distance of about $3\frac{1}{2}$ inches from a photographic film. A magnetic lens consisting of an iron-clad coil with Armco iron pole pieces was used for forming the image. Fig. 1 shows the pole pieces of

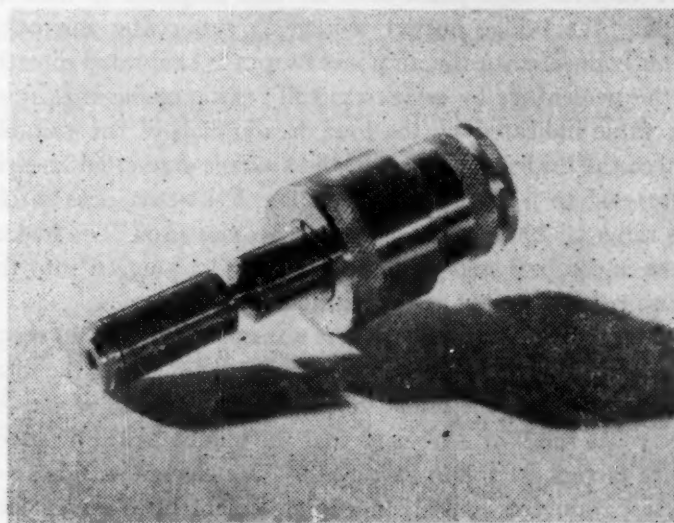


FIG. 1

the magnetic lens, with a specimen inserted at left and a simple film holder attached to the right side. The conditions were selected so that a linear magnification of $1.6\times$ was obtained. Vacuum requirements are very moderate; the mean free path of the electrons is large compared to the apparatus dimensions, even at forevacuum pressure. Preliminary experiments were made with samples of different concentration and thickness of the radioactive layer. Exposure times ranged from 2 to 12 hours, according to the age and concentration of the sample and the numerical aperture of the lens. As a quantitative example, the following may be given: 1 millicurie/mm.² of Ga⁶⁷ at a numerical aperture of 0.04 rad. and a magnification of $1.6\times$ gives a satisfactory photographic density with 1-hour exposure. For the most part, Process-type emulsions were used for the recording of the image. Tracer micrographs can be obtained consistently with good definition if the layer is sufficiently thin to avoid considerable self-absorption. The best resolving power obtained thus far is about 30 μ . Fig. 2 shows comparative exposures of the same speci-



FIG. 2

men both by the radio autograph and by the electron optical method. The electron optical exposures shown are taken with two different limiting apertures having diameters of 0.040 and 0.080 inch, respectively.

Further improvements of the method include an after-acceleration of the β -particles. By such afteracceleration we hope not only to reduce the exposure times but also to achieve a better resolution through a reduction of the spherical aberration. A further reason for afteracceleration is that the

chromatic aberration, which is always present (even in the case of monokinetic sources due to self-absorption), can be reduced markedly if the accelerating potential is at least comparable to, or greater than, the energy of the primary emission.

Staining of Nerve Endings in Mouse Epidermis by Feulgen's Nuclear Reaction

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So far as the writer is aware, there is no satisfactory method for the demonstration of nerve endings, especially in the epidermis. Most impregnation methods using metallic salts are tedious, fickle, and expensive. The chief objection is that the end result, even in successful preparations, though sometimes very beautiful, shows not the nerve itself but the black precipitate of silver salts.

During the study of the effect of methylcholanthrene on nerves in mouse skin, as part of a research project organized by E. V. Cowdry, of the Barnard Hospital, the writer found that nerves and nerve endings can be stained by Feulgen's nuclear reaction. Aside from being easy to operate, less time consuming, and quite specific, this method produces no precipitate. The technique is as follows:

Separate mouse epidermis from dermis by the heat method described by Baumberger, Suntzeff, and Cowdry (1), fixing it in 1 part formalin and 9 parts absolute alcohol saturated with picric acid (2). After carrying the tissue into water, hydrolyze and stain as for thymonucleic acid. The reagents used should be prepared as specified by Cowdry (3). It is not necessary to wash out the picric acid completely. Employ graded alcohols and xylols for dehydration and clearing. Mount in balsam for examination *in toto* or embed in paraffin for sectioning. Staining must be carried out before embedding; otherwise, the stainability of the nerves is somehow impaired. No other precautions are necessary.

Epidermis prepared in this way shows nerve fibers together with their endings and cell nuclei. This coloration of nuclei is an advantage rather than a hinderance, for the relation of nerve endings to the surrounding cells is thereby clarified. The cytoplasm and other structures may be counter-stained with fast green. Slides first prepared in October 1945 are still in perfectly good condition.

Liang (4), also of this laboratory, recently found that nerves can be stained by Schiff's reaction. Consequently, the process of hydrolysis may be omitted. The mechanism of staining is unknown. However, unless nerves and nerve endings are proved to contain thymonucleic acid, the specificity of nuclear reaction for this chemical compound is questionable.

References

1. BAUMBERGER, J. P., SUNTZEFF, V., and COWDRY, E. V. *J. nat. Cancer Inst.*, 1942, 2, 413-423.
2. BENSLEY, R. R., and BENSLEY, S. H. *Handbook of histological and cytological technique*. Chicago: Univ. Chicago Press, 1938.
3. COWDRY, E. V. *Microscopic technique in biology and medicine*. Baltimore: Williams and Wilkins, 1943.
4. LIANG, H. M. *Anat. Rec.*, 1947, 97, 103-104.

Book Reviews

Advances in protein chemistry. (Vol. 3.) M. L. Anson and John T. Edsall. (Eds.) New York: Academic Press, 1947. Pp. xii + 524. (Illustrated.) \$7.50.

This third volume, like its predecessors, contains thorough and critical reviews by specialists of some of the fields of protein chemistry which have been particularly explored during the past few years.

In "The Chemical Determination of Proteins," P. L. Kirk discusses the physical and chemical methods used and emphasizes *inter alia* the pitfalls that can be encountered in the uncritical use of the Kjeldahl method for nitrogen in one or another of its innumerable modifications and the uncertainty of results obtained with salt fractionation of protein mixtures. This review is complemented by that of Max S. Dunn and Louis B. Rockland, "The Preparation and Criteria of Purity of the Amino Acids," which contains also a section on the synthesis of amino acids containing isotopic atoms. Particularly useful are the tables on the specific rotations, resolution, and solubilities of the amino acids, the Van Slyke nitrous acid and ninhydrin manometric methods, and the paragraphs on the semimicro Kjeldahl determinations. A table of references for microbiological determinations is also given.

Roger M. Herriott reviews the "Reactions of Native Proteins With Chemical Reagents" in oxidation, reduction, alkylation including the mustards and 2,4-dinitrofluorobenzene, acylation, deamination, diazotization, etc. Henry B. Bull presents "Spread Monolayers of Protein," primarily from the physical standpoint, while Alexander Rothen, in "Films of Protein in Biological Processes," reviews film transfer, spreading, enzyme films, immunological reactions, and his own results in studying plastic-covered protein films. Arne Tiselius, in "Adsorption Analysis of Amino Acid Mixtures," contributes a detailed discussion of the techniques and methods developed in his laboratory.

Anthony A. Albanese reviews "Amino Acid Requirements of Man," and Robert Elman, "The Use of Protein and Protein Hydrolyzates for Intravenous Alimentation." Both authors, however, seem to have overlooked an added use of protein hydrolyzates in the treatment of the hypoaminoacidemic crises of nephrotic children.

Leonor Michaelis discusses "Ferritin and Apo-Ferritin," and Alexander E. Braunstein reviews "Transamination and the Integrative Functions of the Decarboxylic Acids in Nitrogen Metabolism." The concluding article, "The Plasma Proteins and Their Fractionation," by John T. Edsall, is the most complete summary to date on the plasma proteins, their fractionation, physical properties, amino acid composition, and functions.

The great value of this book is enhanced by the very complete bibliographies and subject and author indexes.

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A bibliography of birds: with special reference to anatomy, behavior, biochemistry, embryology, pathology, physiology, genetics, ecology, aviculture, economic ornithology, poultry culture, evolution and related subjects. Reuben Myron Strong. Chicago: Field Museum of Natural History, 1939 (Pts. 1 and 2), 1946 (Pt. 3). Pp. 464; 469; 522.

This is a monumental work for which no praise is too great. When one reads the subtitle above, one wonders if anything has been omitted. And when one has leafed through Parts 1 and 2 (including rules and symbols employed, key list of abbreviations for periodicals cited, list of periodicals not cited but related to birds, and author catalogue of references) and has searched through Part 3 (Subject Index), he is convinced that no effort has been spared to provide the investigator with everything of value (except distribution, and systematics or classification). And yet no one knows better than the former editor of Vol. III of the *Bibliography of fishes* how impossible it is to get all the citations. No bibliography is ever finished. But for all this, Dr. Strong's *Bibliography of birds* will be the sure and solid foundation on which avian bibliographers will build in the long future.

Years ago, when Dr. Strong first conceived the idea of a bibliography of birds, the reviewer's advice was asked as to the method of procedure. It was suggested that he take the *Bibliography of fishes* (imperfect as it would be found in places) as a guide and that he improve on this work wherever possible. This Dr. Strong has done.

In the front of Part 1 is a key list of abbreviations for periodicals cited, with the names of the periodicals printed in full. This section standardizes the abbreviations and is of great help to beginners and to any who have to do with little-known journals.

When one comes to look up a citation one finds the surname of the author in bold-faced type and his given names in italics, set in a line on the left by themselves. In the vertical line below the surname is the date of each article, also set in boldface. Having author and date of publication in a vertical line on the left, it is easy to pick out the article wanted. If more than one article has been published in one year, these are indicated as 1910a, 1910b. Had these been set 1910.1, 1910.2, as in the *Bibliography of fishes*, they would look better and, with the period separating the 1 from the 1910, would be more easily read. Then too, at outer top of right and left pages are abbreviated guide names in boldface. It would have been better to have put the full name.

Another improvement of great value is the appearance at the end of certain book or journal references (if these are rare or little known) of such hieroglyphics as IJC, etc. Reference to pages 12 and 13 of Part 1 gives the name of the library in which the rare book or journal may be found. This will be of inestimable value to a host of users.

If, as we often hear said, bibliography is the sound basis of all research, then Parts 1 and 2 may be likened to a great

storehouse of learning. Part 3, the Subject Index, is the guide to the particular shelves on which the wished-for data may be found. Here are segregated in alphabetical, chronological order the references to any particular bird, organ, or subject in which the researcher is interested.

But such an extensive warehouse must have a chart or guidebook to help the seeker. This, the Subject Index covering 522 pages, is the most extensive and elaborate known to the writer. The major headings have subdivisions, the latter have their subdivisions, and so on. Evidently Dr. Strong has not depended on the titles for indexing, but has looked up the articles themselves. This prolonged search will explain the multiple or cross references to many articles and books. The use of bold-faced type for the year of publication of an entry (with or without an asterisk) indicates an outstanding article, generally with extensive citation of literature.

One has to work over the Subject Index, however, to realize its thoroughness and its complexity. So great are these things that an alphabetical Finding Index is a necessary key for unlocking the door to the great wealth of the vast and complicated Subject Index. Such an index, now in preparation, is to be published as Part 4. When this has been accomplished and the treasures of this great work made easily available, it will be seen that this is surely the Bibliography of Birds, the most valuable tool ever forged for students of ornithology and an imperishable monument to the labors of the author.

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Organic analytical reagents (Vol. I.) Frank J. Welcher.
New York: D. Van Nostrand, 1947. Pp. xv + 442. \$8.00.

The use of organic substances as reagents in inorganic analysis dates back to the early days of chemistry; indeed, almost 2,000 years ago Pliny tested for iron with papyrus soaked in a solution of nutgalls. This test for iron is still used in vinegar works, although filter paper, cotton, etc. replace the papyrus. It was not, however, until 1905, when Tschugaeff introduced dimethylglyoxime as a specific and highly sensitive reagent for nickel, that the significance of organic analytical reagents was strikingly brought to the attention of chemists. Since 1905, especially during the past two decades, many new organic reagents have been discovered and improved techniques have been developed. In addition to serving as specific or selective reagents in gravimetric and colorimetric analysis, organic compounds have many other uses in analytical procedures, serving as solvents, dry extractants, concentrating liquids, wash liquids, buffers, oxidizing and reducing agents, protective colloids, flocculating agents, stabilizers for certain reagent solutions, coupling agents, primary standards, pH indicators, etc.

Organic analytical reagents is to be published in four volumes, making available in one place a description of all organic compounds employed in making analyses as well as laboratory directions for their use. Volume I includes Chapters on: "The Electronic Theory of Valence" (5 pp.), "Coordination Compounds" (11 pp.), "Chelate Compounds" (9 pp.), "Types of Chelate Rings" (17 pp.), "The Effect of Structure on Solubility" (7 pp.), "Hydrocarbons" (13 pp.), "Substitution

Products of Hydrocarbons" (7 pp.), "Alcohols" (50 pp.), "Phenols" (71 pp.), "Miscellaneous Phenolic Compounds" (36 pp.), "Amino Phenols" (16 pp.), "Phenol Sulfonic Acids" (20 pp.), "8-Hydroxyquinoline and Its Derivatives" (81 pp.), "Azo Derivatives of 8-Hydroxyquinoline" (13 pp.), "Ethers" (15 pp.), "Aldehydes" (19 pp.), and "Ketones" (35 pp.). The book concludes with an index of names and synonyms of organic reagents and one on their uses, arranged alphabetically under the element or radical for which they are employed.

The volume is conveniently arranged for ready reference. The formula, molecular weight, Beilstein reference, properties, and method of preparation are given for each reagent, as well as references to the original literature.

In the first printing of a work of this nature and scope it is difficult to avoid errors. The following are representative of those noted. In Table 5 (p. 22) the bond angles for 8-membered rings should be $-25^{\circ} 32'$ and $-21^{\circ} 35'$ for zero and one double bond, respectively, and $-9^{\circ} 44'$ for four double bonds; for 9-membered rings with four double bonds the value is $-16^{\circ} 29'$. On page 21, third paragraph, three of the bond angles for 7-membered rings are incorrect; the correct values are given in Table 5. On page 249, the molecular weight of $(\text{HO}_2\text{S})_2\text{C}_6\text{H}_2(\text{OH})_2$ is given as 358.2; the correct value is 270.23. Actually, the monohydrate of the disodium salt of this acid is employed, and its molecular weight is 332.2. The sensitivity of this reagent for titanium (p. 251, line 5) should read: "1 part of titanium in 100,000,000 parts of solution . . ."

The great number and variety of organic compounds offers one of the most promising sources for new and better analytical reagents. Volume I of this series is a valuable addition to the reference works in this interesting field of analytical chemistry and, together with the three succeeding volumes, will make a most useful treatise on organic analytical reagents.

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Scientific Book Register

COLIN, EDWARD C. *Elements of genetics*. (2nd ed.) Philadelphia-Toronto: Blakistorn, 1947. Pp. xiii + 402. (Illustrated.) \$3.50.

EDINOFF, MAXWELL LEIGH, and RUCHLIS, HYMAN. *Atomic for the millions*. New York-London: McGraw-Hill, 1947. Pp. xiv + 281. (Illustrated.) \$3.50.

MARKLEY, KLARE S. *Fatty acids: their chemistry and physical properties*. New York: Interscience, 1947. Pp. x + 668. (Illustrated.) \$10.00.

MICHENER, WILLIAM H. *Physics for students of science and engineering*. New York: John Wiley; London: Chapman & Hall, 1947. Pp. x + 646. (Illustrated.) \$4.25.

RIDENOUR, LOUIS N. (Ed.) *Radar system engineering*. New York-London: McGraw-Hill, 1947. Pp. xviii + 748. (Illustrated.) \$7.50.